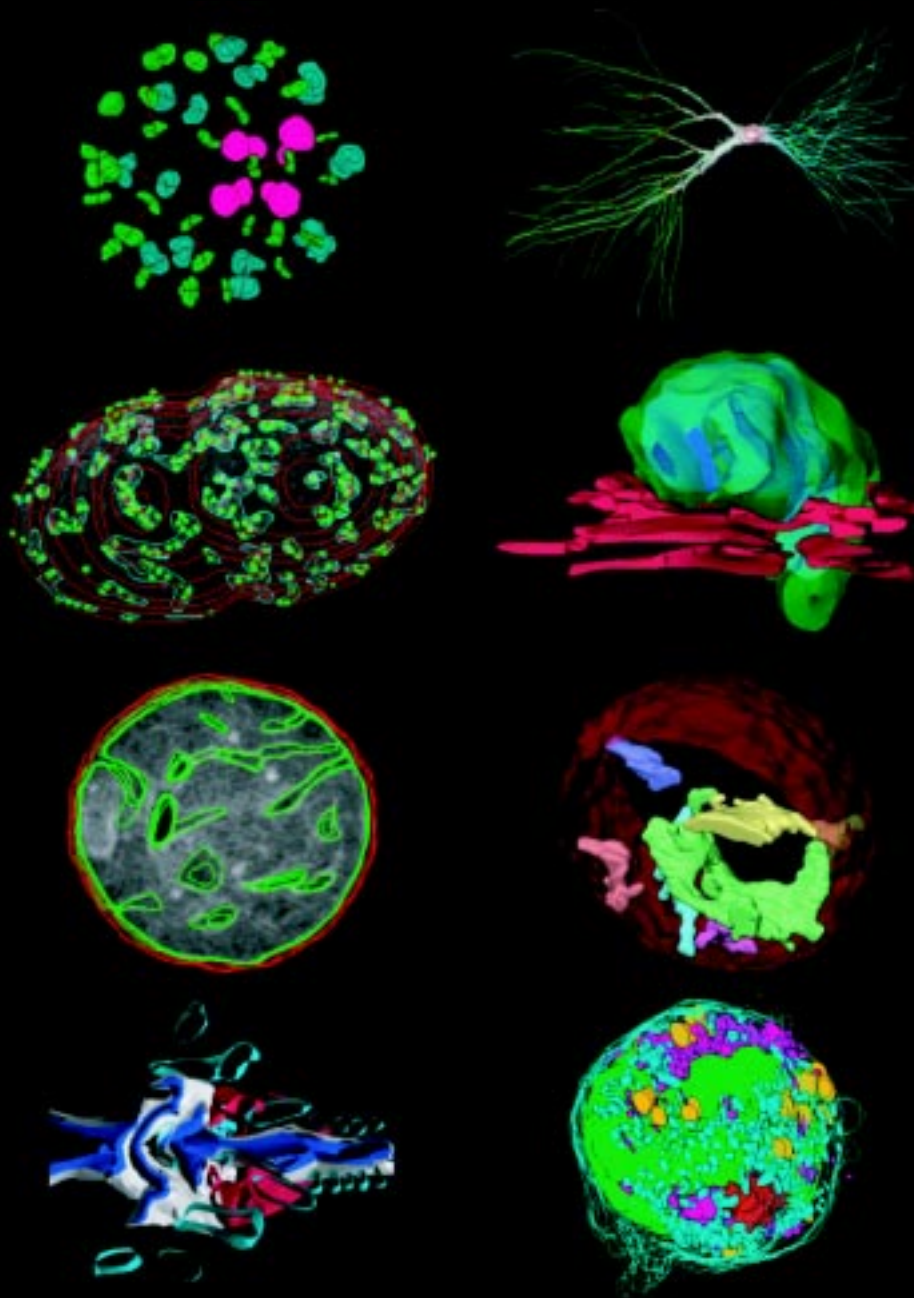


National Patterns of R&D Resources: 1998

An SRS Special Report



**Division of Science Resources Studies
Directorate for Social, Behavioral and Economic Sciences**

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Steven Payson

Division of Science Resources Studies
Directorate for Social, Behavioral, and Economic Sciences
National Science Foundation



March 1999

NOTE

Data in this report are current as of August 1998. Therefore, these data are more current (reflecting updates and revisions) than data on the same variables provided in *Science and Engineering Indicators, 1998*, which had been released in February 1998.

ABOUT THE COVER

This figure was Figure 1 in Marko, M. and Leith, A., “Sterecon—three-dimensional reconstruction from stereoscopic contouring” in *Journal of Structural Biology*, 116:93-98 (1996). Reprinted by permission of the authors and Academic Press. Copyright © 1996.

The pictures shown represent examples of data obtained by users of the Biological Microscopy and Image Reconstruction Resource, which is located within the Wadsworth Center of the New York State Department of Health (http://www.wadsworth.org/spider_doc/bmirr/3-D.html). Each was produced by contouring data obtained from 3-D light microscopic (LM) or high voltage electron microscopic (HVEM) images, using the Sterecon (stereoscopic reconstruction) system developed at the Resource. Most of these pictures, and much of the research associated with them, were made possible through grants from the National Science Foundation and the National Institutes of Health.

Clockwise from upper left: (1) orientation of nuclear cell-division axes in a sea urchin embryo as revealed by confocal LM; (2) dendritic branches of a hippocampal neuron also from a confocal volume; (3) a mammary tumor cell invading the peritoneum reconstructed from serial thick section HVEM; (4) an HVEM tomographic reconstruction of a rat-liver mitochondrion from a single thick section; (5) a human lymphocyte with abnormal golgi reconstructed from serial thick sections; (6) a mouse larynx reconstructed from serial paraffin (histological) LM sections; (7) an intermediate sub-volume tracing used to make the final mitochondrion model shown in number 4; and (8) a low-voltage cryo scanning EM image of a bacterium with islands of a surface protein labeled with immunogold.

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To carry out this mandate, SRS designs, supports, and directs periodic surveys as well as a variety of other data collections and research projects. These surveys yield the materials for SRS staff to compile, analyze, and disseminate quantitative information about domestic and international resources devoted to science, engineering, and technology.

If you have any comments or suggestions about this or any other SRS product or report, we would like to hear from you. Please direct your comments to:

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GETTING INFORMATION ON THE WORLD WIDE WEB

ORDER FORM

ABBREVIATIONS

BEA	Budget Enforcement Act	HHS	Department of Health and Human Services
DC	District of Columbia		
DOC	Department of Commerce	NASA	National Aeronautics and Space Administration
DoD	Department of Defense		
DOE	Department of Energy	NIH	National Institutes of Health
FFRDC	federally funded research and development center	NSF	National Science Foundation
FTE	full-time equivalent	PPP	purchasing power parity
FY	fiscal year	R&D	research and development
GDP	gross domestic product	SSA	Social Security Administration
GSP	gross state product	S&Es	scientists and engineers
		USDA	Department of Agriculture

GENERAL NOTES

The National Science Foundation (NSF) sponsors a series of surveys to collect information on the financial and human resources devoted to research and development (R&D). In this report, NSF survey data on the various sectors of the U.S. economy—industry, government, academia, and selected nonprofit organizations—are aggregated so that the components of the overall R&D effort are placed in a national context. Information presented in *National Patterns* includes the following:

- the level of R&D expenditures;
- the sources of such funds;
- the sector or organization performing the R&D;
- the character of work undertaken (i.e., whether it is basic research, applied research, or development);
- the states in which R&D is undertaken in the United States;
- the number of scientists and engineers employed in R&D; and
- international comparisons with the U.S. effort.

The national totals reported here incorporate data available from several Division of Science Resources Studies (SRS) surveys as of August 1998, as well as projections to cover the entire year. This report, including the appendix tables as separate spreadsheet files, will be made available on the Internet as well, at <<http://www.nsf.gov/sbe/srs/nprdr/start.htm>>.

These notes provide a brief introduction to the concepts used in the report. Important changes and revisions from previous *National Patterns* reports also are highlighted. For complete definitions, descriptions of projection methodologies, and references to the underlying survey reports, see appendix A.

PERFORMER REPORTING BASIS

SRS annually surveys Federal Government agencies, industry, and academia. Respondents in each sector indicate the amounts they spend on R&D in their own sector and the sources of these funds. National historical totals are based on data reported by performers because

they are in the best position to: (1) indicate how much they spent in the actual conduct of R&D in a given year; (2) classify their R&D by character of work; and (3) identify the sector of the economy in which their financing originated. The consistent use of performer reporting reduces the possibility of double-counting and conforms to international standards and guidance.

There are exceptions to the use of performer-reported data. The last complete survey of the nonprofit sector was conducted in 1973, although a survey of nonprofit R&D activity is being undertaken in 1998–99. Since 1973, informal surveys of this sector have been undertaken periodically. Nonetheless, estimates of the R&D performance by nonprofit organizations reported here are generally based on (1) Federal agency reporting of Federal funding to the nonprofit sector and (2) R&D performance trends in the other non-federal sectors.

In addition, NSF sponsors only occasional surveys of state government agencies; the last two surveys covered fiscal years (FYs) 1987–88 and 1995–96. Consequently, the national R&D time-series totals exclude estimates of state agencies' intramural R&D performance. State funds for R&D reported by other sectors of the economy, however, are included in the respective R&D performance totals.

One byproduct of the decision to use performer-reported data is that the federally funded R&D performance totals presented in *National Patterns* differ from the Federal R&D funding totals reported by the Federal agencies that provide the funds. One reason for these differences is that performers of R&D often expend Federal funds in a year other than the one in which the Federal Government provides authorization, obligations, or outlays. (For definitions of these terms, see appendix A.) During the past several years, differences between Federal R&D funding reported by performers and by funding agencies has widened. These trends are documented in Appendix A, tables A-1 and A-2.

PROJECTIONS

Although respondents are continually given the opportunity to revise prior data, R&D totals for 1996 reported here are considered to be actual expenditures. Data reported for 1997 and 1998 are preliminary, in the

sense that 1997 data are based on preliminary reporting of information, and 1998 data are projections made during the summer of 1998 based on information available at that time. The series presented in this *National Patterns* updates projections for 1995 and 1996 that were reported in *National Patterns of R&D Resources: 1996*.

To the greatest extent possible, this report incorporates data for 1998 R&D programs contained in the administration's 1999 budget proposal. The text notes explicitly where these data are used. The budget, however, does not contain estimates on the detailed disaggregation reported in *National Patterns*; most importantly, it includes very little information on the economic sectors receiving the Federal funds. Consequently, Federal agencies' R&D performance for 1997 and 1998 are derived from an NSF survey of 32 Federal agencies coinciding with the third quarter of FY 1997. The amounts reported for 1998 therefore reflect Congressional appropriations, apportionment, and reprogramming decisions as of that time.

R&D performance estimates for 1997 and 1998 for the other sectors of the economy are derived on the basis of three types of information: (1) survey information submitted early by some of the responding institutions, allowing for an early, partial picture of what the aggregate results might be once all survey responses are received; (2) responses by performers to questions about their future plans; and (3) statistical regression and time-series modeling techniques based on observed patterns of R&D expenditure by performers. The precise methodologies used for such estimation are explained in the forthcoming companion document, *Methodology and Procedures Underlying the National Patterns Report: 1998* (see Appendix A: Technical Notes).

NEW FEATURES IN THE 1998 *NATIONAL PATTERNS* REPORT

Consistent calendar-year basis for all data. The previous *National Patterns* report of 1996 provided a combination of fiscal-year expenditure amounts for governmental and academic R&D, and calendar-year expenditure levels for industrial R&D and for R&D performed by other nonprofit organizations. Aggregates of these amounts were then taken, reflecting neither a precise fiscal-year nor calendar-year definition, but a general combination of both. Therefore, for greater consistency and clarity in measurement, and for ease of

calculation (especially in adjustments for inflation), all R&D levels for all performers have since been converted to a calendar-year basis. However, data on the budget authority of the U.S. Federal Government will continue to be in reference to fiscal years, for obvious reasons.

More detailed information. The current data provide more detailed information about R&D by performer, source, and character of work. For example, for federally funded research and development centers (FFRDCs) administered by industrial and nonprofit organizations, this report provides annual breakdowns of R&D by character of work, in contrast to the previous report, which contained only total R&D amounts for these performers. In addition, the new data include current-dollar and constant-dollar amounts for all components of national R&D by performer, source, and character of work, while previous data included constant-dollar amounts only for aggregates of these components by performer or source.

Presentation of data in a database format. Data in the previous report were organized entirely in terms of elaborate spreadsheet formats. Such spreadsheets will continue to be provided, but the new data will also contain, as an additional feature, Appendix Table B-6, which is a single, comprehensive spreadsheet file for 175 columns of data on national R&D components and related variables, covering the full time series 1953–98. Table B-6 is structured, in part, to facilitate the creation of a database file, through its importation into a database software package. The labeling of its columns (or “field labels”) have already been established in a simple, numerical structure. Those labels give data users the ability to find, quickly and easily, any historical data that may interest them, either in Table B-6 itself, or in any database file created from it.

Symmetry of R&D tables with respect to type of performer and sources of funds. Another new feature is that the first four appendix tables are symmetrically arranged to allow for direct comparisons of R&D data organized in two ways: (1) by performer first and then by source, or (2) by source first and then by performer. The first case effectively asks, “what type of organization performs the R&D, and for that type of performer, from what kinds of organizations does it receive its funding?” The second case effectively asks, “what type of organization provides funding for R&D, and to which kinds of performers does it provide those funds?” For further discussion of this feature, see Appendix A: Technical Notes.

More extensive data. Overall, this 1998 *National Patterns* report provides more extensive data on R&D expenditure levels and related variables than previous reports. Examples include:

- **Finer levels of detail on R&D expenditures.** This detail is provided through the addition of new data columns that did not previously exist, and through the creation of symmetric tables on source of funds by performer and on performer by source of funds (as described above).
- **Historical data on R&D expenditures by State.** Previous reports provided data on R&D by performer for each state, but only for the most recent year for which data were available, which in this report would be 1995. This report provides these data not only for 1995, but also for 1987, 1989, 1991, and 1993.
- **Greater detail on the industrial nonmanufacturing sector.** In previous *National Patterns* reports, all industrial R&D carried out in “nonmanufacturing” industries was treated as a single concept that was not subdivided into the various sectors within this broad industrial category. Owing to improvements in the Survey of Industrial Research and Development, R&D in nonmanufacturing is now subdivided into several components for the most current years of 1995 and 1996. These components include, for example: communications; electric, gas, and sanitary services; computer and data processing services; other business services; health services; and engineering and management services.

Simpler presentation of dollar amounts and growth rates. For the sake of clarity, the current *National Patterns* report now abides by the following guidelines:

- Within the text of the report, all reported dollar amounts are *nominal* amounts. Dollar amounts in constant 1992 dollars are provided in many of the appendix tables.
- All growth rates reported, unless otherwise specified, are in *real* terms, i.e., adjusted for inflation, and they refer to the average rate of growth per year.

A New Section. A new section, “Why Statistics on R&D Expenditures Are Collected and Analyzed” was

added for background. This section might also help readers interpret and analyze the information provided in the *National Patterns* report.

A listing of references to published studies that have relied upon *National Patterns* data. As simply a few examples, the following recent publications were found in the *Social Science Citation Index* and other sources as relying on *National Patterns* reports:

Brennan, M.; J.R. Long and P. Zurer, “Facts and figures for chemical R&D,” *Chemical and Engineering News*, October 19, 1998, 52–82.

Jankowski, J., “R&D: The foundation for innovation . . . changes in U.S. industry,” in *Trends in Industrial Innovation: Industry Perspectives and Policy Implications*, Sigma Xi, The Scientific Research Society, Inc., Research Triangle Park, NC, 1998, pp. 201–211.

Kortum, S.S. “Research, patenting, and technological change,” *Econometrica* 65: (6) 1389–1419, Nov. 1997.

Larson, C.F. “Helping innovation with research-on-research,” *Chemtech* 27: (12) 12–16 Dec, 1997.

Mowery, D.C. “The changing structure of the US national innovation system: implications for international conflict and cooperation in R&D policy,” *Research Policy*, 1997, 639–654.

Moore, K. “Organizing Integrity - American science and the creation of public-interest organizations, 1955–1975,” *American Journal of Sociology*, 1996, Vol. 101, Iss 6, pp 1592–1627.

Wei, C.C., “The current status of R&D activities in Taiwan,” *International Journal of Technological Management*, 1997, 13: (5-6) 563–570.

However, many other published studies have also relied on *National Patterns* data. In the near future, efforts will be made to create a much larger list, generated from reader feedback, which will be provided to readers as an additional appendix to the *National Patterns* report. As this list expands, it will be organized by general area of study, which would serve as a tool for colleagues studying the information provided in the *National Patterns* report. (See the appeal on the following page for reader feedback on this project.)

REFERENCES TO *RESEARCH STUDIES* THAT USE *NATIONAL PATTERNS* DATA

INSTRUCTIONS FOR HAVING US ADD A REFERENCE TO ONE OF OUR LISTS

Please help us serve you better . . .

We would be grateful for any references that you could provide for us. You are welcome to tell us about your own published work or work published by others.

We are collecting and displaying these “references to research studies” for four reasons:

- To help researchers who are working on science-resource topics find each other and learn about each other’s results;
- To see how our data are being used and studied, so that we may develop them to better meet our customers’ needs;
- To learn, and help inform others, about what has actually been discovered with regard to science resources; and
- To better contribute to the literature on science resources (both scholarly and publicly-oriented literature) through increased interaction with the rest of the research community.

Criteria for being listed as a reference. . .

We will list *all* references that meet the following criteria, and will *not* make any value judgments regarding the quality of the research conducted.

The work in question must make *significant use* of data provided in the *National Patterns* report. That is, at least one of the main findings of the work (e.g., one of the key points made in a conclusion section) relies on the use of *National Patterns* data.

The work must be *published* in an outlet that is generally recognized as *contributing to* (and not just reporting on) the current body of knowledge on science resources or related topics. Such outlets include:

- Articles published in journals with significant recognition as contributors to scholarly thought. To make this requirement feasible in practice, we require that the journal meet at least one of the following two criteria:
 - It is included in either the Science Citation Index or the Social Science Citation Index of the Institute for Scientific Information (ISI).
 - It is a peer-reviewed, technical journal that is commonly held by major academic libraries.
- Books and monographs that are recognized by the Library of Congress as published works. This could include individual chapters of a book with contributions from multiple authors.
- Doctoral dissertations, also recognized by the Library of Congress.

How to inform us about a reference you would like us to list . . .

Just send us the a copy of the work in the regular mail, along with a signed cover letter that provides a full reference to the work and a statement that your research did rely on *National Patterns* data. Earmark the pages and highlight the text where *National Patterns* data are mentioned. For books, dissertations, and monographs, you need only send one chapter that best demonstrates reliance on *National Patterns* data. Copies made on both sides of a page are acceptable.

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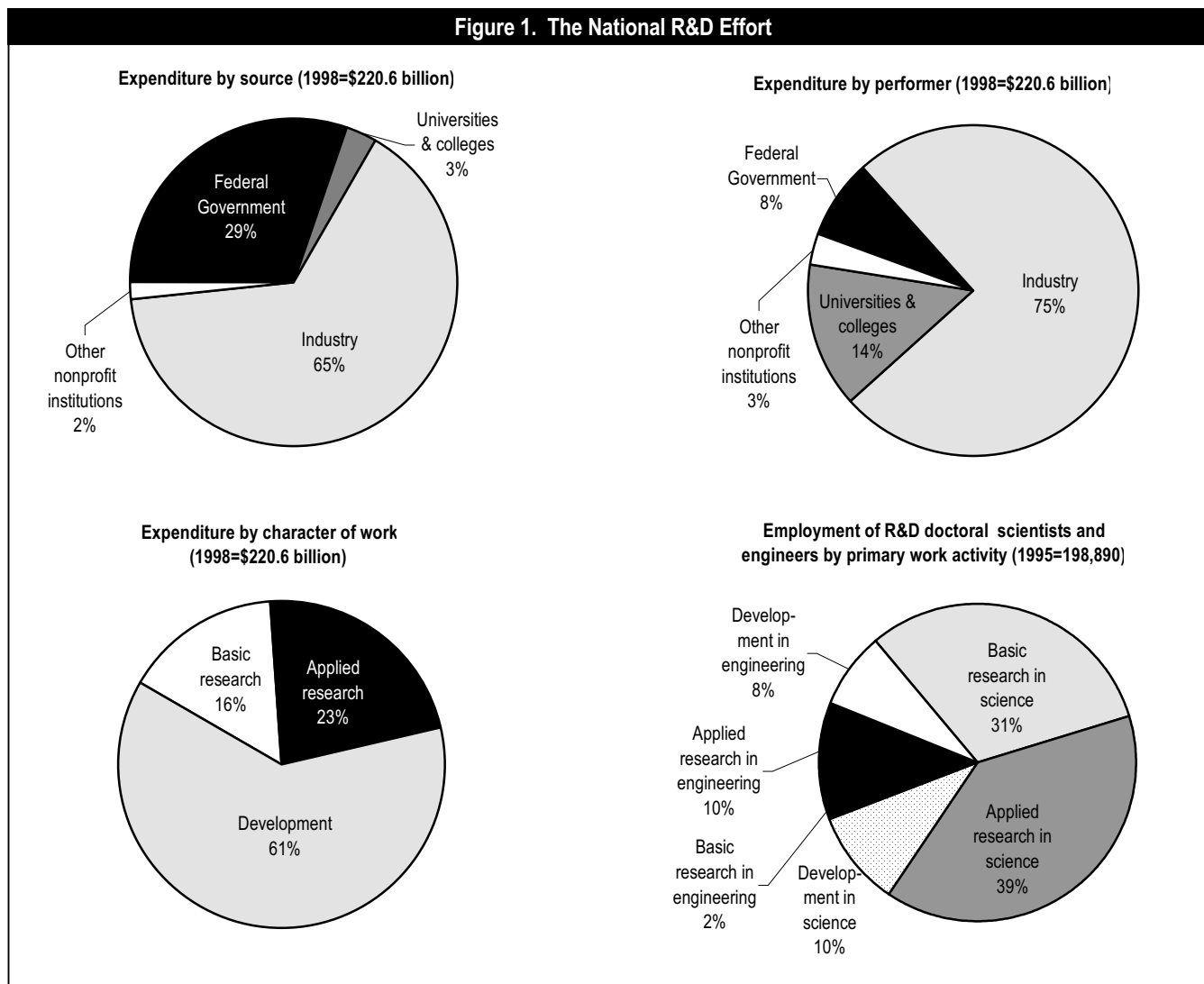
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HIGHLIGHTS

TOTAL R&D EXPENDITURES

- By current projections, total annual research and development (R&D) expenditures in the United States will be \$220.6 billion in 1998, of which 65 percent will be provided by industry (figure 1). This level of R&D expenditure represents a 5.3-percent increase, after adjusting for inflation, over the \$205.6 billion estimated for 1997. In turn, the 1997 estimate represents a 2.8-percent increase over 1996, and the 1996 level a 4.7-percent increase over 1995, after adjusting for inflation in each case.
- The entire economy of the United States, as measured by gross domestic product (GDP) is estimated to reach \$8,456 billion in 1998. Adjusted for inflation, GDP increased an estimated 2.7 percent in 1998, after a 3.8-percent increase in 1997, and a 2.8-percent increase in 1996. Consequently, R&D as a share of GDP will reach 2.61 percent in 1998, up from 2.54 percent in 1997, and 2.57 percent in 1996. This 1998 share is the highest since 1992's 2.64 percent, and reflects a continuation of a general upturn that began in 1994 after a three-year decline from 1991-94.

Figure 1. The National R&D Effort



NOTES: Details may not add to 100 percent because of rounding. R&D funds for federally funded R&D centers are included in their affiliated sectors. For employment of R&D doctoral scientists and engineers, development in science and development in engineering include "design."

SOURCE: National Science Foundation/Division of Science Resource Studies; tables B-1A, B-2A, B-2B, B-3A and B-28.

- Growth in total U.S. R&D expenditures was relatively slow in 1985–95, but is now accelerating. In the past, annual R&D growth had been much higher—e.g., from 1975–85 it averaged 5.6 percent in real terms. That rate then slowed to 1.6 percent in 1985–95. However, annual real R&D growth in 1995–98 is expected to average 4.3 percent. Almost all of the recent growth in national R&D expenditures is the result of a resurgence of industrial R&D.
- Despite this recent increase, the R&D share is still below levels reached in the early 1990s (2.64 percent in 1992). The historic high since 1957 for the Nation's R&D/GDP ratio was reached in 1964 at 2.87 percent; the low was 2.12 percent in 1978.

INDUSTRY PARTICIPATION

- Since 1980, industry has provided the largest share of financial support for R&D, projected to reach \$143.7 billion in 1998, or 65.1 percent of the total. This funding represents a 7.7-percent increase in real terms over the preliminary 1997 level. Of these funds, nearly all (\$140.8 billion) will be devoted to R&D performed by industry itself, with the remainder directed toward academic R&D (\$1.8 billion) and R&D performed by other nonprofit organizations (\$1.0 billion).
- Industry—including industry-administered federally funded research and development centers (FFRDCs)—is expected to perform 75.1 percent of the Nation's total R&D in 1998. The projected \$165.7 billion in R&D performance by industry represents an 8.5-percent increase in real terms over the preliminary 1997 level. Of this industrial R&D performance in 1998, 85.0 percent will be supported by industry's own funds; Federal funding will account for the remaining 15.0 percent. The Federal share of industry's performance total has fallen considerably from its all-time high of 32 percent in 1987.

FEDERAL PARTICIPATION

- Federal R&D support in 1998 is expected to be \$66.6 billion, a 0.8-percent increase in real terms over 1997. The Federal share of support for the Nation's R&D first fell below 50 percent in 1978,

and it remained between 45 and 50 percent until 1988. It then fell steadily, dropping from 42.6 percent in 1988 to a current all-time low of 30.2 percent projected for 1998.

- The Federal Government is expected to perform \$16.9 billion of R&D in 1998, a real increase of 0.2 percent from 1997. Federal agencies are estimated to account for 7.7 percent of national R&D performance in 1998, reflecting, again, a continual decline in the Federal performance share that began in the mid-1970s.

PARTICIPATION OF UNIVERSITIES, NONPROFIT ORGANIZATIONS, AND STATE GOVERNMENTS

- Other R&D funds, provided by universities and colleges, state and local governments, and other nonprofit institutions, in combination, are expected to reach \$10.3 billion in 1998, reflecting a 3.4-percent real increase over their 1997 level.
- Universities and colleges, excluding academically administered FFRDCs, are expected to account for 11.6 percent (\$25.7 billion) of national R&D performance in 1998; this is a moderate real increase (3.1 percent) over 1997.

R&D SEPARATED INTO BASIC RESEARCH, APPLIED RESEARCH, AND DEVELOPMENT

- Of the projected \$220.6 billion spent on R&D in 1998, \$34.4 billion (or 15.6 percent) is expected to be for basic research, \$49.8 billion (22.6 percent) for applied research, and \$136.4 billion (61.8 percent) for development. In comparison with 1997, R&D performance in 1998 reflects a 2.4-percent real increase in basic research, a 6.2-percent real increase in applied research, and a 5.8-percent real increase in development.
- The amount of basic research conducted as a proportion of total R&D varies enormously by sector. From 1970–98, basic research was between 62 and 67 percent of all university and college R&D (including university and college-administered FFRDCs). For industry

R&D (excluding industry-administered FFRDCs) it has ranged between only 3 and 6 percent, and for Federal intramural R&D it has ranged between 13 and 17 percent. This maximum of 17 percent for basic research as a percentage of Federal R&D is expected for 1998, reflecting an upward trend that has been occurring since 1988.

- Industry and industry-administered FFRDCs, combined, are expected to account for 25.0 percent (\$8.6 billion) of the Nation's basic research performance in 1998. Universities and colleges are expected to account for 51.1 percent (\$17.6 billion), and their FFRDCs for another 7.8 percent (\$2.7 billion). The remaining basic research performance will be carried out by the Federal Government, comprising 8.3 percent (\$2.9 billion) of the total, and by other nonprofit organizations and their affiliated FFRDCs—7.8 percent (\$2.7 billion). While Federal Government performance of all R&D is expected to rise only 0.2 percent in real terms, Federal performance of basic research is expected to rise 4.2 percent.

R&D PERFORMANCE BY STATE

- R&D is substantially concentrated in a small number of states. In 1995, California had the highest level of R&D expenditures—over \$36 billion—representing approximately one-fifth of the \$177 billion U.S. total. The six states with the highest levels of R&D expenditures—California, Michigan, New York, Massachusetts, New Jersey, and Texas (in decreasing order of magnitude)—accounted for approximately one-half of the entire national effort.
- The 10 states with the highest R&D intensity (ratio of R&D to Gross State Product) in 1995 were, in descending order, New Mexico (8.1 percent), the District of Columbia, Michigan, Massachusetts, Maryland, Delaware, California, Connecticut, Rhode Island, and Washington (the latter with an intensity of 3.5 percent)

U.S./INTERNATIONAL COMPARISONS

- Due to the size of its economy, the United States spends more on R&D than any other country, though it does not spend as high a proportion of

its economy on R&D as some other countries. In 1996, the most recent year for which comparable international data are available, the U.S. spent 2.57 percent of its GDP on R&D, compared to 2.77 percent spent by Japan in 1995 (the latest year's data available for that country), 2.32 by France, 2.28 by Germany, 1.94 by the United Kingdom, 1.66 by Canada, and 1.03 by Italy.

- Nondefense R&D as a percent of GDP was 2.11 for the United States in 1996, which was lower than for Germany (2.20), and Japan (2.73 in 1995), but higher than for France (2.04 in 1995), the United Kingdom (1.71), Canada (1.63), and Italy (0.98 in 1995).

R&D SCIENTISTS AND ENGINEERS

- The estimated number of scientists and engineers employed in 1995 on R&D activities in the United States is approximately 987,700. This figure reflects a 1.3-percent average annual increase from the 1993 level of 962,700. It reflects only a 2.1-percent annual increase over the 1985 figure of 801,900, the first year for which revised national tabulations are available.
- In 1996, industry employed approximately 859,300 full-time equivalent (FTE) R&D scientists and engineers (S&Es). The industrial sector with the most R&D S&Es was transportation equipment, with 18.5 percent of the FTE total, mostly involving R&D on aircraft and missiles. Electrical equipment was the second-largest employer of R&D S&Es, with 15.2 percent, mostly involving R&D on electronic components such as computer chips. Chemical and allied products accounted for another 10.7 percent, and machinery, including office computers, accounted for another 10.2 percent. The next largest R&D S&E employment sector was in services, rather than manufacturing—computer and data processing services accounted for 9.4 percent of all industrial R&D S&Es.
- In 1995, approximately 484,780 doctoral scientists and engineers were employed in the United States; 41.0 percent reported R&D as their primary work activity; teaching as a primary activity accounted for 22.1 percent; management/sales/administration, 16.4 percent; computer applications, 4.4 percent; and other professional services and activities, 16.2 percent.

WHY STATISTICS ON R&D EXPENDITURES ARE COLLECTED AND ANALYZED

Economic growth is widely viewed as a key factor that influences the well-being of individuals and societies. In broad terms, it is attributable to two processes: growth in economic resources—natural resources, labor, and physical capital—and improvements in quality and productivity—producing more and/or better products from the same resources. The first of these, while an important source of growth, is often limited by basic physical constraints. For example, a nation may experience economic growth through an expanded labor force, but economic output per person may remain unchanged. More natural resources may be exploited, but often at the expense of limiting their availability for future use. In contrast, the accumulation of physical capital, i.e., structures and equipment, is more commonly welcomed as a reflection of economic progress. Such accumulation, though, also drains additional resources, either directly through additional consumption of fuel and materials, or indirectly through depreciation and its associated replacement costs.¹

The second causal factor of economic growth—improvements in quality and productivity—need not involve the kinds of trade-offs associated with the growth of economic resources. Through improvements in human capital, physical capital, and organizational operations, advances in science and engineering can offer more and/or better products without consumption of additional resources. Such advances, or technological changes, may not always be beneficial, as adverse consequences sometimes lead to the realization that not all new technologies are worthwhile. Nevertheless, knowledge is usually cumulative, and as societies learn from their mistakes, people and nations might continue to benefit from scientific and engineering accomplishments.

It follows that economic growth, especially in the long run, is highly dependent on the R&D activities of scientists

and engineers. However, the precise relationship between R&D and improvements in quality and productivity (such as the time lag between R&D and its economic effects) has been extremely difficult for economists to identify and measure, and that relationship varies greatly by the types of products and services developed.²

Moreover, like expenditures on anything, expenditures on R&D may tell little about the ultimate quality or value of what is received from the money being spent. This is especially the case when one is examining individual projects, where any assessment of the true value of an endeavor is confounded by its interaction with other R&D projects. In the aggregate, this interaction among industrial sectors, “or interindustry technology flows” has, itself, become a topic of research and analysis.³

As an example of the complexity of R&D analysis, even if a project is deemed a complete failure, its failure might provide researchers with the knowledge that the particular path undertaken had been wrong, thereby helping to steer future R&D endeavors in the right direction. In addition, philosophical and cultural issues could arise in any assessment of a project. For instance, basic research enhances fundamental knowledge, which in turn enhances applied knowledge. Nevertheless, whether, or to what extent, fundamental knowledge is a desired end in itself would be determined, in part, by societal values, rather than economic analysis alone.

Yet, despite the uncertainties about the meaning and value of information on R&D expenditures, such information is collected extensively by the United States

¹Economists familiar with this topic might criticize this perspective as simplistic, because productivity increases may be embodied in the quantity of measured capital. (See, for example, Griliches, Z., “Hedonic Price Indexes and the Measurement of Capital and Productivity: Some Historical Reflections,” in *Fifty Years of Economic Measurement: The Jubilee of the Conference on Research in Income and Wealth*. E. Berndt and J. Triplett, eds., University of Chicago Press, Chicago, 1990; and Payson, S. “The Difficulty of Measuring Capital, Revisited,” *Technological Forecasting and Social Change*, Vol. 56, No. 2, October 1997.)

²For recent analyses of the relationship between R&D and economic growth, see, for example: Griliches, Zvi, “Productivity, R&D, and the Data Constraint,” *American Economic Review* Vol. 84: 1–23, 1994; Nordhaus, William D. (1994) “Do Real Output and Real Wage Measures Capture Reality? The History of Lighting Suggests Not.” Cowles Foundation Discussion Paper No. 1078, September, 1994; Payson, S., “Quality Improvement Versus Cost Reduction: A Broader Perspective on Evolutionary Economic Change,” *Technology Analysis & Strategic Management*, Vol. 10, No. 1, 69–88, 1998; and Rosenberg, N., and R. Nelson. “American Universities and Technical Advance in Industry,” *Research Policy* Vol. 23: 323–348, 1994.

³See, for example, Schnabl, H., “The Subsystem—MFA: A Qualitative Method for Analyzing National Innovation Systems—The Case of Germany,” *Economic Systems Research*, Vol. 7, No. 4, 1995.

and many other nations, and it is disseminated and studied worldwide by analysts in a wide variety of fields. One reason for this broad interest is that *aggregate* R&D expenditure data is a measure of the level of economic purchasing power that has been devoted to R&D projects as opposed to alternative economic activities. More precisely, industrial (private-sector) funding of R&D, which represents most of R&D expenditure in the United States, may be interpreted as an economic measure of how important R&D is to U.S. companies, which could have easily devoted those funds to any number of other purposes. Likewise, government support for R&D reflects government and society's commitment to scientific and engineering advancement, which is an objective that, of course, competes for dollars against other functions served by discretionary government funding. The same basic notion holds as well for the other sectors that fund R&D—universities and colleges, and other nonprofit organizations.

In effect, in broader terms R&D expenditures measure the *perceived* economic importance of R&D *relative* to all other economic activities. Because institutions invest in R&D without knowing the outcome (if they did know the outcome, then it would not be R&D), the amount they devote will be based on their perception, rather than their knowledge, of R&D's value. As already

argued, that value is relative because it competes with other forms of investment.

Such information about R&D's perceived relative value is extremely useful for economic decisionmaking. For example, if R&D in a particular field of study increases, this may reflect an increase in demand for scientists and engineers to study and work in that field. An increase in R&D in a particular industrial sector could be among the first signs that the sector is about to expand with new lines of products or services. Of course, R&D data alone would not be enough to accurately analyze the future growth of a field of study or an industrial sector, but it may well be an important input into any such analysis.

In conclusion, the R&D data presented in this report provide important information for economic and social decision making, and may even provide clues into our future as a society. We provide these data for this very reason—to encourage and facilitate useful analyses of the nation's economic and social conditions. As mentioned above, we are now soliciting your feedback on the details of how our data have already been used successfully in published studies. As we acquire this kind of information, we will tabulate and summarize it in future reports, in addition to using it in our continual efforts to improve our data.

TRENDS IN NATIONAL R&D SUPPORT

R&D expenditures in the United States are expected to reach \$220.6 billion in 1998.⁴ This amount implies a nominal growth rate (without accounting for inflation) of 7.3 percent over the 1997 preliminary level of \$205.6 billion, or a real-growth rate (after adjusting for expected inflation) of 5.3 percent.⁵ The 1997 level of R&D reflects a 4.9-percent nominal growth over \$196.0 billion spent in 1996, or 2.8-percent real growth.

The Gross Domestic Product, the main measure of the nation's total economic activity, grew in real terms by 2.7 percent in 1998, and 3.8 percent in 1997, by preliminary

estimates, growing faster than R&D in 1997, but slower than R&D in 1998. Since 1994, however, R&D has generally been outpacing the overall growth of the economy, thereby becoming a larger component of the economy—from 2.43 percent of GDP in 1994 to 2.61 percent in 1998.

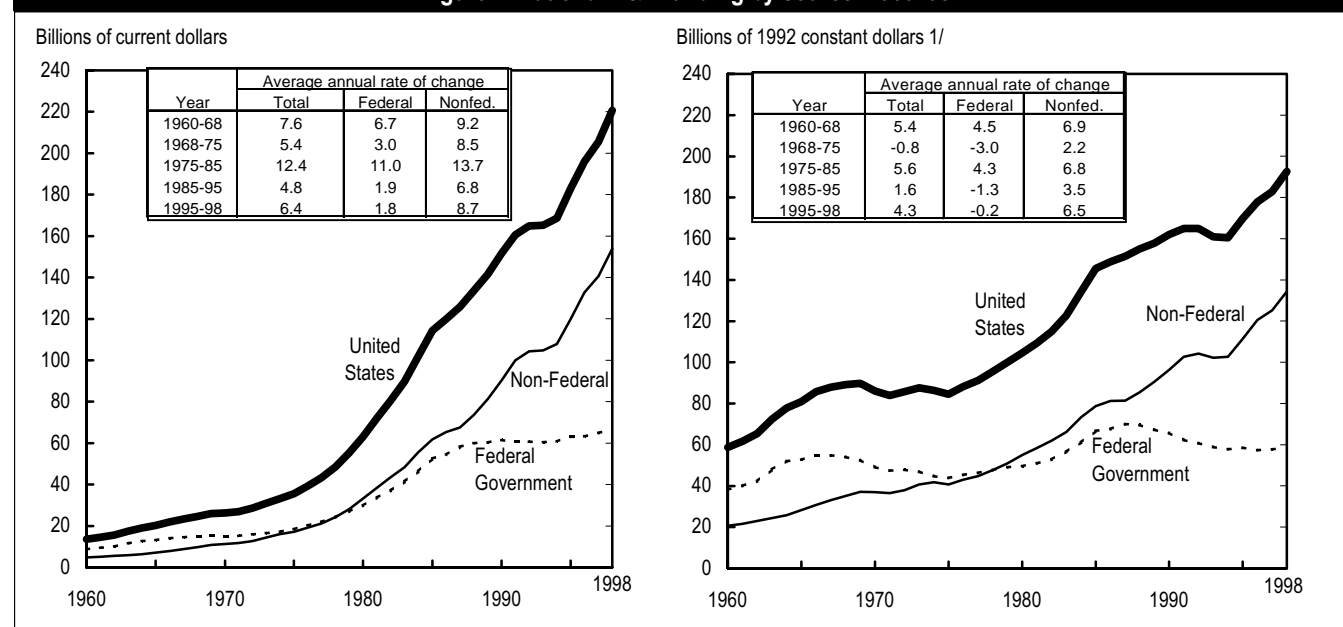
In 1998, the Federal Government is expected to provide 30.2 percent (\$66.6 billion dollars) of total projected funds for R&D; industry will supply 65.1 percent (\$143.7 billion in current dollars), and the remaining sectors of the economy, i.e., state governments, universities and colleges, and other nonprofit institutions, will contribute 4.7 percent (\$10.3 billion).

Starting in 1969 and for nearly a decade thereafter, R&D growth failed to keep up with either inflation or general increases in economic output. In fact, between 1968 and 1975, real R&D expenditures declined 5 percent, due to both business and government de-emphasizing funding for research programs (figure 2). Federal funding in particular fell considerably during this period (down 19 percent in real terms). Both Federal defense- and nondefense-related R&D programs declined.

⁴ Except for discussions of the Federal budget authority, which are in reference to fiscal years, other references to years in this report are with respect to calendar years, not fiscal years, even in discussions on academic and Federal intramural performance. Other NSF reports on academic or Federal expenditures alone, however, refer to fiscal years, because those institutions operate on a fiscal year basis. Calendar years are used in the *National Patterns* report, however, for consistency with industry data, which represent the largest share of U. S. R&D expenditure, and for consistency with the vast majority of all other national economic statistics provided by Federal statistical agencies.

⁵ For a discussion about how dollar amounts are adjusted for inflation in this report, see Appendix A: Controlling for Inflation and Foreign Currency.

Figure 2. National R&D funding by source: 1960–98



1/ Based on GDP implicit price deflator.

NOTE: Data are preliminary for 1997 and 1998.

SOURCE: National Science Foundation/Division of Science Resources Studies, table B-1A.

Following an economic recovery from the 1974 oil embargo and the 1975 recession, a significant funding reversal occurred. U.S. R&D expenditures increased in real terms by approximately 72 percent from 1975–85, compared with a 37-percent rise in real GDP over the same period.

During the first half of this period (1975–80), there was considerable growth in Federal R&D funding for nondefense activities. Although defense-related R&D expenditures rose annually, much of the Federal R&D gain was attributable to energy-related R&D (particularly nuclear energy development) and to greater support for health-related R&D. Non-federal R&D increases were concentrated in industry and resulted largely from greater emphasis on energy conservation and improved use of fossil fuels. Consequently, energy concerns fostered increases in R&D funding by both Federal and non-federal sources. Support for energy R&D rose over 150 percent in real terms between 1974 and 1979 and accounted for approximately one-half of the national increase in real R&D spending.

Overall, the U.S. constant-dollar investment in total R&D grew at an average annual rate of 4.4 percent during 1975–80. Although the rate of increase remained rather steady through 1982 (between 4 and 5 percent annually), the focus of the national R&D effort began to shift heavily toward defense-related activities in the early eighties. Largely as a result of increases in defense R&D, growth in real R&D expenditures accelerated to an average annual rate of 8.2 percent over 1982–85: not since the space-inspired spending thrust in the early sixties had R&D in the United States grown so rapidly during any 3-year period. On average, from 1980–85, R&D spending increased 6.8 percent per year in real terms.

This pattern of a generally increasing rate of real R&D growth, however, changed abruptly in the mid-eighties and continued through the early nineties. From 1985–94, R&D spending slowed to a 1.1-percent annual real rate of increase, in comparison to a 2.4-percent annual real growth in GDP. Some slackening of both Federal and non-federal funding of R&D, as a proportion of GDP, had contributed to this slowing. However, it is primarily the decline in real Federal R&D funding, as reported by R&D performers, that contributed to the slow growth of R&D in the early nineties.⁶

⁶ In recent years, increasing differences have been detected in data on federally financed R&D as reported by Federal funding agencies, on the one hand, and by performers of the work (federal labs, industry, universities, and other nonprofit organizations), on the other hand. This divergence in R&D totals is discussed in Appendix A.

The downward trend was then reversed in 1994, caused by substantial increases in industrial R&D.⁷ By preliminary estimates, U.S. R&D grew in real terms by 4.7 percent per year between 1994 and 1998, in spite of virtually no real growth (0.2 percent) in Federal R&D support. Over the same period, industrial support for R&D grew at a real annual rate of 7.3 percent, by preliminary calculations. Much of this increase might be explained by the favorable economic conditions that generally existed over the past 4 years.

TRENDS IN FEDERAL SUPPORT

As a share of the national R&D total, Federal Government funding has continued to decline in recent years. Though it was previously the primary provider of the Nation's R&D funds, the Federal Government's share of R&D funding first fell below 50 percent in 1979. From 1980–88, the Federal Government provided between 44 and 47 percent, but has fallen systematically since that time. The preliminary Federal R&D funding in 1998, \$66.6 billion, represents a 0.8-percent increase from the preliminary 1997 level in real terms. Consequently, due to the notable increase in industrial support, the Federal Government's estimated share of R&D support for 1998, 30.2 percent, is the lowest ever recorded in the data series (which begins in 1953).⁸

Even with its declining share of the national total, Federal R&D funding did expand between 1980 and 1998 (from \$29.9 to \$66.6 billion), which, after inflation, amounted to a small, real growth rate of 0.9 percent per year. This rate, however, was not at all uniform across the period. From 1980–85, Federal R&D funding grew on average by 6.2 percent in real terms annually. Support then slowed considerably in 1986, reflecting the budgetary constraints imposed on all government programs, including those mandated by the Balanced Budget and Emergency Deficit Control Act of 1985 (also known as the Gramm-Rudman-Hollings Act) and subsequent legislation (notably the Budget Enforcement Act of 1990, which legislated

⁷ For a detailed discussion of this upturn, see Jankowski, J., "R&D: The Foundation for Innovation . . . Changes in U.S. Industry," in *Trends in Industrial Innovation: Industry Perspectives and Policy Implications*, Sigma Xi, The Scientific Research Society, Inc., Research Triangle Park, NC, 1998, pp. 201–211.

⁸ The sample design for estimating industry R&D expenditures was revised for 1991 and later years. The effect of the change in industry's sample design was to reduce the Federal share of the national R&D total to 38 percent in 1991, down from the 41-percent share previously published for 1991. See appendix A for more information on these survey changes and their impact on the R&D estimates.

that new spending increases be offset with specific spending cuts). Since then, the Federal R&D data reflect the government's growing emphasis on deficit reduction and a shift in the balance between defense and domestic programs. As a consequence, real Federal R&D support has declined on average by 1.1 percent per year over 1985–98, by preliminary calculations.

Nearly all the rise in Federal R&D funding during the early eighties was due to large increases in defense spending, as evidenced by the figures on the Federal budget authority (figure 3). For example, defense activities of the Department of Defense (DoD) and the Department of Energy (DOE) accounted for roughly one-half of total Federal R&D budget authorizations in 1980.⁹ By 1986, such defense-related activities peaked at 69 percent of the Federal R&D budget authority.

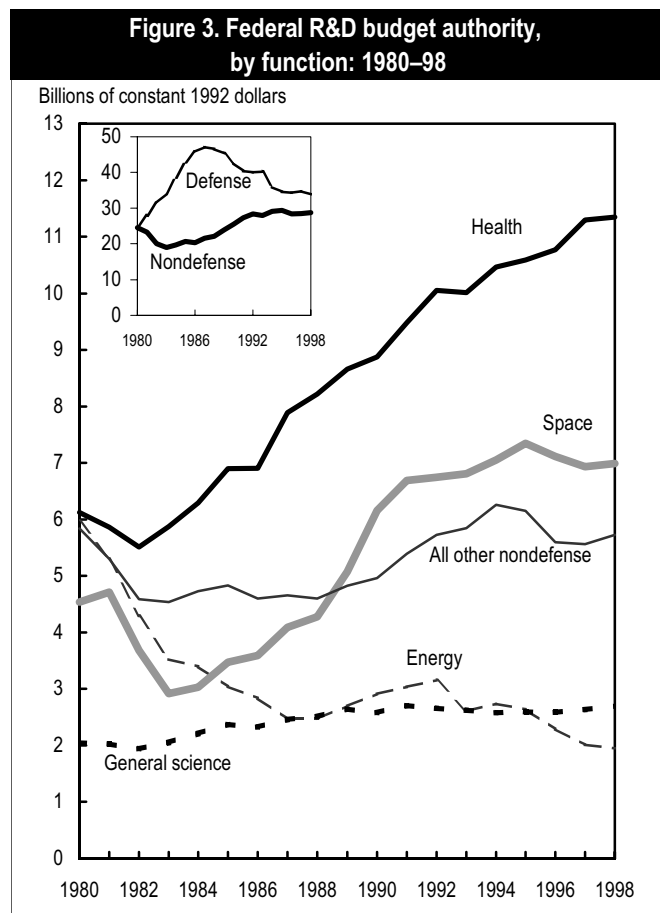
⁹ These percentage share calculations of defense-related R&D activities are based on Federal budget authorization totals, not on data reported by the performers of R&D.

After 1986, Federal R&D spending priorities shifted, resulting in part from additional budgetary pressures and from modifications in U.S. security measures in an evolving international arena. Thus, the defense buildup in the early and mid-1980s was followed by a period of moderate reductions in the late 1980s, a leveling of R&D spending in the early 1990s, and a return to planned, moderate reductions in the mid-1990s. Since 1986, Federal budget authority for civilian-related R&D grew faster than defense-related R&D. In particular, the budget allocation for health- and space-related R&D increased substantially between 1986 and 1998, with average real annual growth rates of 4.6 and 6.0 percent, respectively, using preliminary figures for 1998. (As indicated in figure 3, most of this growth in the budget authority for space-related R&D occurred between 1986 and 1991.) The budget allocation for defense programs declined by an average real annual rate of 2.3 percent during the same period. As a result, in 1998, defense-related R&D accounts for an estimated 54.1 percent of the 1998 total Federal R&D budget authority, in contrast to 69.3 percent for 1986.

Based on preliminary figures, R&D accounts for 15 percent of the Federal defense-related budget authority for 1998, and 3 percent of the Federal nondefense authority (table 1). In nondefense areas, R&D accounts for 75 percent of general science funds, nearly all of which (94 percent) is devoted to basic research (table 2). R&D accounts for 67 percent of funds for space research and technology, most of which (61 percent) is devoted to development. Among funds for health, R&D represents 10.0 percent, most of which (54 percent) is devoted to basic research, and nearly all of which (95 percent) is directed toward programs of the National Institutes of Health (NIH).

In the area of energy, the Department of Energy actually registers a negative total budget authority because of offsetting receipts received from sales of the Strategic Petroleum Reserve. Consequently, the concept of R&D expenditure as proportion of total budget authority would not be meaningful in this case.

At first glance, the R&D budget authority for energy appears to have declined rapidly, from \$2.4 billion in 1997 to only \$1.1 billion (by preliminary estimates) in 1998. However, this effect is not an actual decline in economic resources devoted to energy R&D, but merely the result of reclassification. Specifically, beginning in FY 1998 several DOE programs were reclassified from “energy” to “general science,” so that the \$1.3 billion drop from \$2.4 to \$1.1 billion in energy R&D was equally offset by



NOTES: The larger graph pertains to nondefense R&D only. Data are preliminary for 1997 and 1998.

SOURCE: National Science Foundation/Division of Science Resources Studies; table B-10.

Table 1. R&D as a percentage of Federal budget authority, by function: FY 1998

Budget function	R&D total (preliminary 1998)	Federal total	R&D share
	[Billions of dollars]		[Percent]
Total	73.639	1,687.308	4.4
On-budget.....	73.639	1,364.917	5.4
National defense.....	39.871	267.560	14.9
Nondefense (on-budget).....	33.768	1,097.357	3.1
Health.....	13.557	135.031	10.0
Space research and technology.....	8.265	12.312	67.1
Energy 1/.....	1.143	(0.384)	NA
General science.....	4.210	5.642	74.6
Natural resources and environment.....	2.015	24.356	8.3
Transportation.....	1.920	42.979	4.5
Agriculture.....	1.243	10.591	11.7
All other.....	1.415	866.830	0.2

1/ The budget authority for Energy is negative because of offsetting receipts from sales of the Strategic Petroleum Reserve.

KEY: NA = Not applicable

NOTES: Because of rounding, components may not add to the totals shown. Data are derived from the administration's 1999 budget proposal. On-budget totals are for all Federal Government transactions except those of the social security trust funds (Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds) and the Postal Service.

SOURCES: National Science Foundation/Division of Science Resources Studies, and Office of Management and Budget, *The Budget for Fiscal Year 1999*, Historical Tables, and National Science Foundation/Division of Science Resources Studies, *Federal R&D Funding by Budget Function: Fiscal Years 1997–99*, NSF 99-315.

a \$1.3 billion rise in general science from \$2.9 billion to \$4.2 billion. (See appendix table B-10.)

For the Nation as a whole, defense-related R&D climbed from 24.2 percent of the total R&D effort in 1980 to 31.8 percent in 1987. In 1998, defense-related R&D fell to 16.4 percent of total R&D expenditures, according to preliminary findings (figure 4). These shares by national objective represent a distribution of performer-reported R&D data. They are distinct from the budget authority shares reported above that are based on the various functional categories that comprise the Federal budget. (See appendix A).

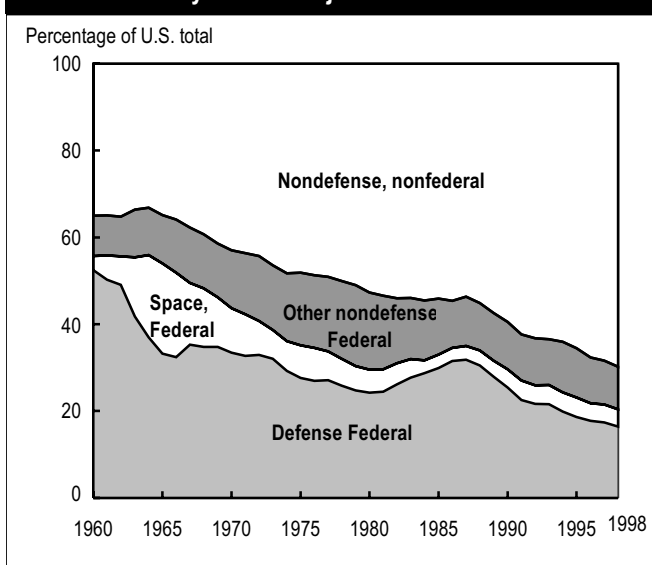
Table 2. Budget authority for R&D by function and character of work: Anticipated levels for FY 1998

Budget function	Basic research	Applied research	Develop- ment	R&D total
	[Millions of dollars]			
Total	15,710	15,570	42,359	73,639
National defense.....	1,099	4,308	34,463	39,871
Nondefense (total).....	14,611	11,261	7,895	33,768
Health.....	7,361	4,618	1,578	13,557
Space research and technology.....	1,658	1,591	5,015	8,265
Energy.....	257	370	516	1,143
General science.....	3,944	266	0	4,210
Natural resources and environment.....	156	1,667	191	2,015
Transportation.....	459	1,258	203	1,920
Agriculture.....	560	589	94	1,243
All other.....	216	902	297	1,415

NOTE: Because of rounding, components may not add to the totals shown.

SOURCES: National Science Foundation/Division of Science Resources Studies, *Federal R&D Funding by Budget Function: Fiscal Years 1997–99*, NSF 99-315, and unpublished tabulations.

Figure 4. R&D spending as a percentage of total, by national objective: 1960–98



NOTES: All industry-funded R&D is classified as civilian R&D, including outlays by aerospace and electronic industries. Data are preliminary for 1997 and 1998.

SOURCE: National Science Foundation/Division of Science Resources Studies; table B-9.

Space-related R&D funding, as a percent of total R&D funding, had reached a peak of 20.8 percent in 1965, during the height of U.S. efforts to exceed the Soviet Union in space travel. It has declined steadily since that time, to a low of 3.0 percent in 1984 and 1986. By 1990 it was back up to 4.2 percent and has remained between 4.0 and 4.5 percent since that time. Federal support for “civilian-related” R&D (nondefense-nonspace programs), as a percent of total U.S. R&D, has been declining steadily since 1994, when it was 11.7 percent. It is expected to be 9.8 percent in 1998, the lowest since 1962 (when it was 9.1 percent).

Preliminary estimates of Federal R&D obligations for 1998 indicate that seven Federal agencies have R&D obligations of over \$1 billion, out of the total Federal R&D obligations of \$69.8 billion. These are, in descending order of R&D obligations: DoD (with a 48.7 percent share of the total), HHS (18.8 percent), NASA (13.3 percent), DOE (8.1 percent), NSF (3.4 percent), USDA (2.0 percent), and the Department of Commerce (DOC) (1.5 percent) (table 3).

In contrast to total R&D obligations, only three agencies have intramural R&D expenditures that exceed

Table 3. Preliminary Federal R&D obligations, total and intramural by agency: FY 1998

Agency	Total R&D obligations (millions of current dollars)	Total R&D obligations as a share of Federal total (percent)	Intramural R&D (millions of current dollars)	Percent of agency R&D obligations that are intramural 1/	Percent change in real intramural R&D from previous year 2/
Department of Defense.....	34,030.4	48.7	7,698.8	22.6	-12.9
Department of Health & Human Services.....	13,127.4	18.8	2,872.3	21.9	0.5
National Aeronautics & Space Administration.....	9,272.0	13.3	2,318.0	25.0	1.2
Department of Energy.....	5,636.3	8.1	636.9	11.3	28.4
National Science Foundation.....	2,346.9	3.4	17.9	0.8	-3.0
Department of Agriculture.....	1,376.0	2.0	937.0	68.1	-0.5
Department of Commerce.....	1,035.9	1.5	705.2	68.1	-3.2
Department of Transportation.....	666.1	1.0	202.4	30.4	20.9
Department of the Interior.....	595.6	0.9	521.9	87.6	1.5
Environmental Protection Agency.....	553.9	0.8	282.5	51.0	7.8
Department of Veterans Affairs.....	240.3	0.3	238.7	99.3	-14.5
Agency for International Development.....	225.0	0.3	25.6	11.4	34.3
Department of Education.....	225.5	0.3	9.6	4.3	7.1
Smithsonian Institution.....	132.0	0.2	132.0	100.0	0.4
Tennessee Valley Authority.....	44.0	0.1	44.0	100.0	-31.1
Nuclear Regulatory Commission.....	53.9	0.1	13.5	25.0	1.9
Department of Labor.....	38.0	0.1	18.1	47.6	-0.2
Department of Justice.....	85.2	0.1	40.5	47.5	-3.1
Department of the Treasury.....	52.9	0.1	39.2	74.1	-1.4
Department of Housing & Urban Development.....	39.5	0.1	24.8	62.8	18.7
Social Security Administration.....	37.1	0.1	5.1	13.7	257.5
US International Trade Commission.....	6.0	0.0	6.0	100.0	1.5
Library of Congress.....	11.7	0.0	11.7	100.0	16.0
Department of State.....	0.8	0.0	0.3	37.5	-1.9
Other Agencies 3/.....	6.0	0.0	4.4	73.3	-8.1
Entire Federal Government 4/.....	69,838.4	100.0	16,806.5	24.1	-5.4

1/ Intramural activities include actual intramural R&D performance and the costs associated with the planning and administration of both intramural and extramural programs by Federal personnel. For the definition of intramural performers, see Definitions for Classification and Measurement, in appendix A.

2/ Based on fiscal year GDP implicit price deflators for 1997 and 1998 (table B-5).

3/ Includes: Appalachian Regional Commission, Consumer Product Safety Commission, Federal Communications Commission, Federal Trade Commission, National Archives and Records Administration, US Arms Control and Disarmament Agency, and US Information Agency.

4/ Numbers do not total exactly, due to rounding.

SOURCE: National Science Foundation/Division of Science Resources Studies, Survey of Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998.

\$1.0 billion in 1998, including costs associated with planning and administering extramural R&D programs: DoD, HHS (which includes NIH), and NASA.¹⁰ These three agencies, together, account for 80.8 percent of all Federal R&D obligations for 1998, and 76.7 percent of Federal intramural R&D, by preliminary tabulations.

TRENDS IN NON-FEDERAL SUPPORT

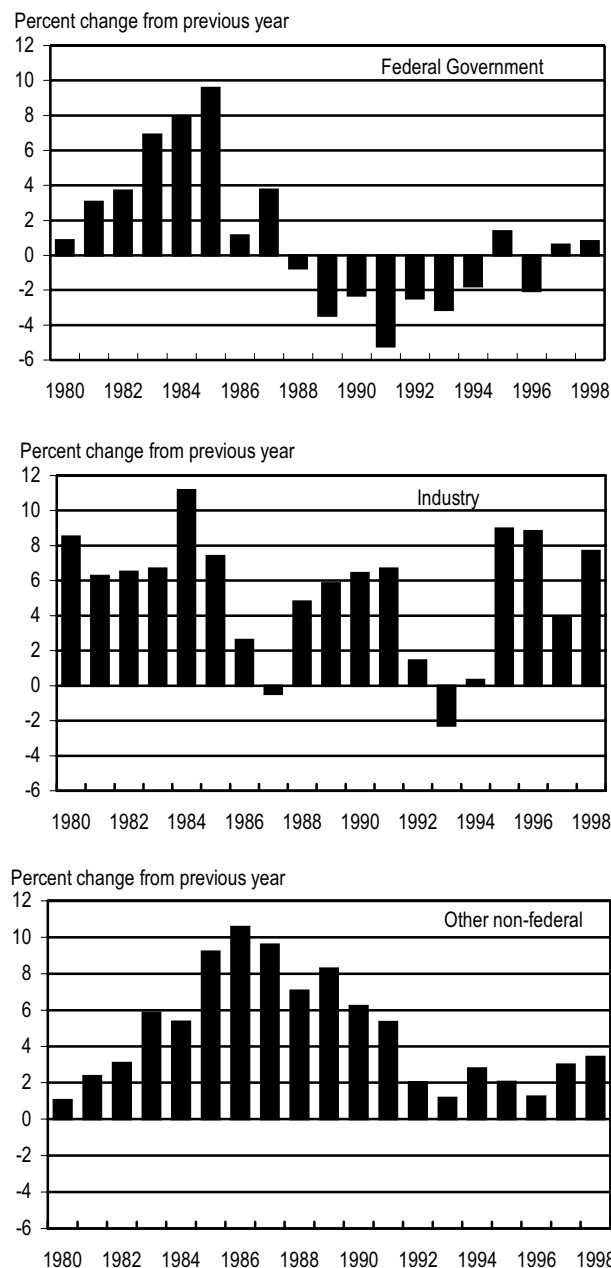
Between 1980 and 1985, concurrent with gains in Federal R&D spending, R&D support from non-federal sources grew substantially—by 7.4 percent per year after inflation. It then slowed to 4.1 percent between 1985 and 1990, and 2.9 percent between 1990 and 1995, but is expected to be back up to 6.5 percent for the 1995–98 period.

Most non-federal R&D support is provided by industry. Of the projected 1998 non-federal total (\$154.0 billion), 93.3 percent (\$143.7 billion) is company funded, representing a 7.7-percent increase over its 1997 level in real terms. Industry's share of national R&D funding first surpassed that of the Federal Government in 1980, and it has remained higher ever since. From 1980–85 industrial support for R&D, in real dollars, grew at an average annual rate of 7.6 percent. This growth was maintained through both the mild 1980 recession and the more severe 1982 recession (figure 5). Key factors behind increases in industrial R&D included a growing concern with international competition, especially in high-technology industries; the increasing technological sophistication of products, processes, and services; and general growth in defense-related industries such as electronics, aircraft, and missiles.

Between 1985 and 1994, growth in R&D funding from industry was slower, averaging only 2.8 percent per year in real terms. This slower growth in industrial R&D funding was only slightly greater than the real growth of the economy over the same period (in terms of real GDP), which was 2.4 percent. In contrast, from 1994–98, by preliminary estimates, it grew in real terms by 7.3 percent per year, compared with a 2.8 percent for the economy overall.

¹⁰ Estimates are for FY 1998 Federal intramural obligations as reflected in the administration's 1998 budget proposal (see appendix A) and cover costs associated with planning and administering intramural and extramural R&D programs by Federal personnel, as well as actual intramural R&D performance. See NSF, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*, NSF 98-332.

Figure 5. Annual changes in national R&D spending, by source of funds: 1980–98 (based on constant 1992 dollars)



NOTE: Data are preliminary for 1997 and 1998.

SOURCE: National Science Foundation/Division of Science Resources Studies; table B-1B.

As one might expect, however, growth of industrial R&D varies significantly among different industrial sectors.¹¹ The industrial sectors with the largest annual growth in real R&D performance, from non-federal sources, between 1986 and 1996, have been: non-manufacturing¹² (16.2 percent); lumber, wood products, and furniture (12.4 percent); paper and allied products (7.6 percent), and electrical equipment (4.3 percent). Those industries experiencing the greatest annual declines (or negative growth) in R&D over the same period were: stone, clay, and glass products (-9.7 percent); primary metals (-5.1 percent); petroleum refining and extraction (-4.9 percent); and food, kindred, and tobacco products (-1.1 percent) (table 4).

R&D funding from other non-federal sectors—namely academic and other nonprofit institutions, including the support they receive from state and local governments—has been more consistent over time. It grew in real terms at average annual rates of 5.2 percent between

¹¹ For studies of patterns of technological change among different industrial sectors, see, for example, Nelson, R. "Recent evolutionary theorizing about economic change," *Journal of Economic Literature*, 33, 1:48-90, 1995; Pavitt, K., "Sectoral patterns of technological change: Towards a taxonomy and a theory," *Research Policy*, 13:343-373; Payson, S., "Product Evolution and the Classification of Business Interest in Scientific Advances," *Knowledge and Policy*, Vol. 9, No. 4, 1996-97; and Utterback, J.M., "The dynamics of product and process innovation in industry," in C.T. Hill & J.M. Utterback, eds., *Technological innovation for a dynamic economy*, New York: Pergamon Press: 1979.

¹² See appendix A, the section on "Use of 'Nonmanufacturing' as a Single Industrial Category." Further, as a result of recent improvements (since 1992) in the NSF sampling of firms located in the service sector, it is not clear to what extent the nonmanufacturing sector has rapidly expanded its share of the Nation's R&D, or how much of the apparent increase is due solely to improved measurement techniques.

1980 and 1985, 8.3 percent between 1985 and 1990, 2.7 percent between 1990 and 1995, and, by preliminary calculations, 2.5 percent between 1995 and 1998. The projected \$10.3 billion in funding in 1998 is 3.4 percent higher in real terms than its preliminary 1997 level. Most of these funds have been used for research performed within the academic sector.

Table 4. Change in non-federal funds for industrial R&D, by industry, 1986 and 1996

Industry	SIC code(s)	R&D		Average annual real growth in R&D
		1986	1996	
		[Millions of dollars]		[Percent]
Other manufacturing industries 1/.....	27,31,39	380	2,423	16.64
Nonmanufacturing industries 1/.....	--	4,740	29,170	16.23
Lumber, wood products, and furniture.....	24,25	144	634	12.40
Paper and allied products.....	26	538	1,534	7.62
Electrical equipment.....	36	9,767	20,356	4.30
Chemicals and allied products.....	28	8,664	17,520	3.99
Rubber products.....	30	655	1,269	3.54
Professional and scientific instruments.....	38	4,752	8,207	2.36
Textiles and apparel.....	22,23	246	414	2.10
Fabricated metal products.....	34	800	1,322	1.91
Transportation equipment.....	37	13,567	20,535	1.02
Machinery.....	35	10,701	13,338	-0.92
Food, kindred, and tobacco products.....	20,21	1,280	1,564	-1.12
Petroleum refining and extraction.....	13,29	1,971	1,630	-4.91
Primary metals.....	33	786	637	-5.10
Stone, clay, and glass products.....	32	941	463	-9.72

1/ Due to revisions in survey methodology, statistics for "Other manufacturing industries" for 1996 are not comparable with statistics for prior years.

SOURCE: National Science Foundation/Division of Science Resources Studies, Research and Development in Industry 1995-96, NSF 99-312

MEASURES AND COMPARISONS OF NATIONAL RESOURCES FOR R&D

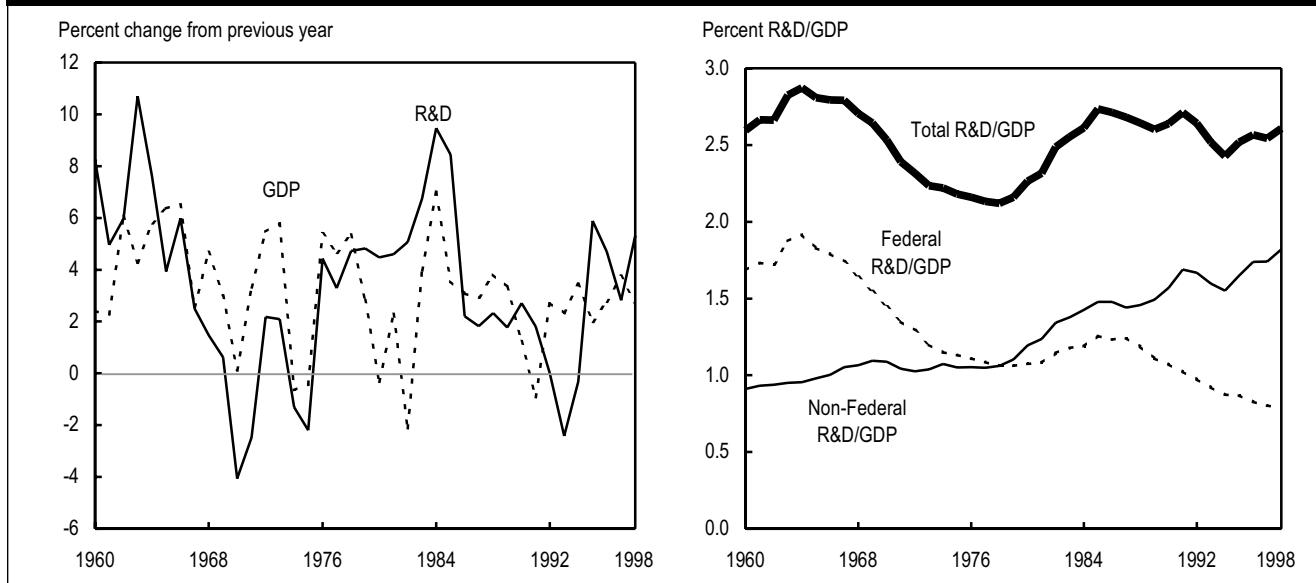
This section examines two indicators of R&D spending: (1) the ratio of total R&D expenditures to GDP, and (2) the ratio of Federal funds expended for R&D to total Federal funds. Also presented is a comparison of U.S. R&D resources with those of other countries. These measures and comparisons show that growth in total U.S. R&D expenditures is now accelerating, after a period of relatively slow growth in the early 1990s. In 1980–85, annual R&D growth had been much higher, averaging 6.8 percent in real terms. That rate then slowed to 2.2 percent in 1985–90, and to 0.9 percent in 1990–95. However, annual real R&D growth in 1995–98 is expected to average 4.3 percent (figure 6). Almost all of the recent growth in national R&D expenditures is the result of a resurgence of industrial R&D. In comparison to its major international competitors, the U.S. appears, by preliminary estimates, to be taking the lead at expanding R&D efforts, while the other nations appear to be experiencing near-zero growth in R&D in real terms.

U.S. R&D/GDP RATIO

Growth in R&D expenditure should be examined in the context of the overall growth of the economy, because, as a part of the economy itself, R&D is influenced by many of the same factors, such as population changes, capital accumulation, and technological advancement. For instance, if population and physical capital each increase by 5 percent from one year to the next, causing the GDP to rise by 5 percent as well, then one would expect, assuming nothing fundamental has changed, that R&D expenditures would also rise by 5 percent. Conversely, if R&D is not observed to grow at the same rate as GDP, then fundamental changes are likely taking place. Furthermore, the ratio of R&D expenditures to GDP may be interpreted as a measure of the Nation's commitment to R&D.

A review of U.S. R&D expenditure as a percent of GDP over time shows an initial low of 1.36 percent in

**Figure 6. Annual changes in GDP and R&D, and the R&D/GDP ratio: 1960–98
(based on constant 1992 dollars)**



NOTE: Data are preliminary for 1997 and 1998.

SOURCE: National Science Foundation/Division of Science Resources Studies; tables B-5 and B-6.

1953, rising to its highest peak of 2.87 percent in 1964, followed by a gradual decline to 2.12 percent in 1978. From the low in 1978, U.S. R&D expenditures rose steadily again to a peak of 2.74 percent in 1985, and did not fall below 2.6 until 1993. In 1994, the rate dropped to 2.43, the lowest it had been since 1981. Starting in 1994, however, R&D/GDP has been experiencing an upward trend. As a result, the current expected ratio of 2.61 for 1998 is the highest the ratio has been since 1992.¹³

The initial drop in the R&D/GDP ratio from its peak in 1964 largely reflected Federal cutbacks in defense and space R&D programs, although gains in energy R&D activities between 1975 and 1979 resulted in a relative stabilization of the ratio at around 2.2 percent. Over the entire 1965–78 period, the annual percentage increase in real R&D was less than the annual percentage increase in real GDP. In years that real R&D spending decreased during that period, real GDP also fell, but at a lower rate (figure 6).

The rise in R&D/GDP from 1978–85 was as much due to a slowdown in GDP growth as to increased spending on R&D activities. For example, the 1980 and 1982 recessions resulted in a slight decline in real GDP, while there was no corresponding reduction in R&D spending. During previous recessions, changes in funding for R&D tended to match or exceed the adverse movements of the broader economic measures.

R&D/GDP then went from 2.74 percent in 1985, to 2.60 percent in 1989, and back up to 2.71 percent by 1991. Again, the ratio tended to fall when GDP experienced relatively fast real growth and rise when it experienced relatively slow real growth. Nevertheless, R&D itself was also affected. The share of R&D that was defense related dropped from 29.9 percent in 1985 to 22.5 percent in 1991. Commensurate with this change was the sharp fall in the share of R&D that was federally funded, from 45.9 in 1985 to 37.7 in 1991. This decline in Federal funding was counterbalanced by increased industrial funding, as described above in the discussion of industrial trends.

With regard to the R&D/GDP ratio, the period from 1991–98 in some respects mirrors the period from 1985–91. Both began with a “local maximum” (a maximum with respect to the few years both before and after the

year in question), then experienced a local minimum in roughly the middle of the period, and an upturn thereafter to a new local maximum. Thus, 1991 began with a ratio of 2.71 percent, fell to 2.43 in 1994, and rose again to 2.61 percent in 1998 by preliminary estimates. As in the 1985–91 period, the 1991–98 period experienced the greatest fall in R&D/GDP (from 2.52 in 1993 to 2.43 in 1994) when GDP experienced high growth, from \$6,558 billion to \$6,947 billion, or 3.46 percent growth in real terms.

U.S. FEDERAL R&D FUNDS/TOTAL BUDGET RATIO

One way to gauge the U.S. Government’s priority for R&D is to compare Federal outlays for R&D with Federal outlays for all purposes.¹⁴ Total Federal outlays (for on-budget programs only) for fiscal year (FY) 1998 are estimated at \$1.348 trillion.¹⁵ R&D is expected to account for 5.29 percent (\$71.4 billion) of those total outlays (figure 7 and appendix table B-11).

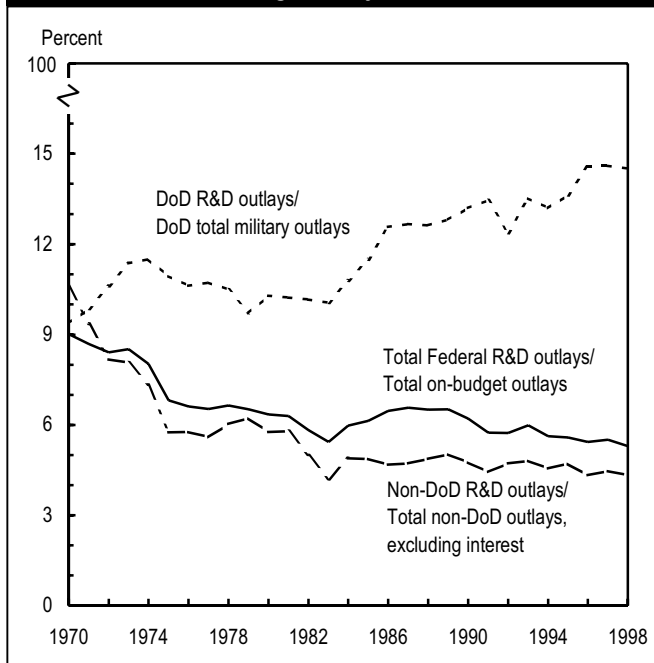
From FYs 1970–83, R&D outlays as a percent of total outlays declined steadily, especially during the early seventies, dropping from 9.0 to 5.4 percent. This trend was dominated by a sharp fall in non-DoD R&D outlays as a proportion of all non-DoD outlays (excluding interest on the national debt), which ranged from 10.6 percent in FY 1970 to 4.2 percent in 1983. In contrast, throughout the same period, R&D funded by the Defense Department as a proportion of total DoD outlays went from a low of 9.4 percent in 1970, to a peak of 11.5 percent in FY 1974, to 10.1 percent by 1983. The declining share of non-DoD R&D was not confined to one or two agencies but was a result of both slow growth in most non-DoD agencies’ R&D outlays and a relatively rapid expansion of the non-R&D component of the Federal budget for civilian agencies.

¹⁴ This idea is applicable in most years. However, in exceptional years in which there are extenuating circumstances, like a major war, Federal outlays for purposes other than R&D may reflect those extenuating circumstances rather than “the government’s priority for R&D.”

¹⁵ Almost all off-budget receipts and disbursements are for social security programs (the Federal Old-Age and Survivors Insurance and the Federal Disability Insurance trust funds), which are excluded from the budget totals by the Balanced Budget and Emergency Deficit Control Act of 1985. Preliminary off-budget outlays for FY 1998, as provided in the President’s 1999 budget proposal, are \$320 billion. See Office of Management and Budget, *The Budget of the United States Government, Fiscal Year 1999* (Washington, D.C.: U.S. Government Printing Office, 1998).

¹³ See Payson, S., “R&D as a Percent of GDP Is Highest in Six Years,” Division of Science Resources Studies, *Data Brief*, National Science Foundation, NSF 99-302.

Figure 7. Ratio of Federal R&D outlays to total budget outlays: 1970–98



KEY: DoD = Department of Defense

NOTES: Excludes off-budget outlays, which are mostly for social security programs. Data are preliminary for 1997 and 1998. DoD R&D outlays are not strictly comparable to "defense R&D," as they do not include Department of Energy atomic weapons R&D.

SOURCES: National Science Foundation/Division of Science Resources Studies, Department of Commerce, and Office of Management and Budget, table B-11.

After FY 1983 the percentage of all Federal outlays devoted to R&D first rose and then fell. The ratio peaked at 6.6 percent in FY 1987, remained at 6.5 percent in FYs 1988–89, but fell steadily since then, to a preliminary level of 5.3 percent in FY 1998. Most of the increases in Federal R&D/total outlays in FYs 1984–86 were due to relatively large increases in DoD R&D. Before 1990, this increase in DoD R&D was not offset by the relative decline in non-DoD R&D—as had been the case in the 1970s—or by the growing share of the Federal budget for interest payments.¹⁶ In the 1990s, the declining R&D outlay ratio can be attributed to a relative decrease in non-DoD R&D as a proportion of non-DoD, non-interest, outlays. Concurrently, however, R&D has taken on relatively increasing importance in a shrinking DoD budget.

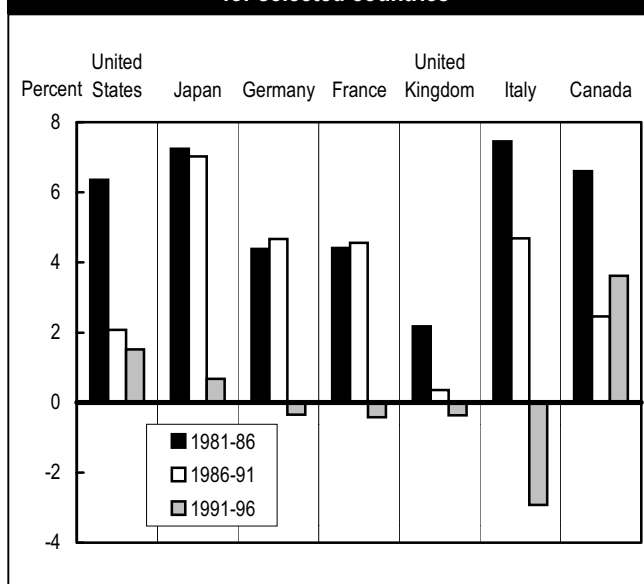
¹⁶ As a percentage of total Federal on-budget outlays, interest payments on the national debt rose from 13.9 percent in FY 1983 to 19.4 percent in FY 1989. In FY 1998 the preliminary share of on-budget outlays for interest payments is 21.5 percent (see appendix table B-11).

INTERNATIONAL COMPARISONS

The R&D/GDP ratio discussed above can be used to determine the relative emphasis placed on R&D activities by the United States and other countries, which is not directly related to the total size of their economies. Another useful measure is to compare the number of R&D scientists and engineers in a country with its total labor force. Use of these ratios bypasses many of the problems in interpretation caused by inflation, exchange-rate fluctuations, different unit costs, and variations in the volume of research efforts. Caution must nonetheless be exercised in making even these international comparisons, because each country measures its R&D and personnel somewhat differently.

From 1991–96, total R&D expenditures stagnated or declined in six of the largest (group of seven) R&D-performing countries: the United States, Japan, Germany, France, United Kingdom, and Italy. In only Canada was consistently growing R&D the exception (figure 8), although, as noted above, R&D growth now is also accelerating in the U.S. Indeed, for more than a decade, these countries have displayed similar aggregate R&D trends: substantial inflation-adjusted R&D growth in the early 1980s, followed by a general tapering off in the late 1980s, and then level or declining real R&D expenditures

Figure 8. Annual rates of change in real R&D spending, for selected countries



NOTE: Rates of average annual change based on inflation-adjusted currencies. The rate shown for Japan is for 1991–95 due to unavailability of 1996 data.

SOURCE: National Science Foundation/Division of Science Resources Studies, table B-30.

into the 1990s. For most of these countries, economic recessions and general budgetary constraints had the effect of slowing both industrial and government sources of R&D support. In particular, both factors have contributed to the major reversal of R&D trends in Japan, where R&D spending has declined recently after experiencing inflation-adjusted gains of about 8 percent annually during the previous decade. The same is true for the United Kingdom and Italy, where real growth in the 1980s gave way to declining R&D expenditures after taking into account overall inflation.

Additionally, geopolitical changes have resulted in cutbacks in government support for defense-related R&D that, in turn, have reduced reported national R&D growth patterns in some countries, most notably in the United States and France. For Germany, the integration of the former East German science and technology system into that of West Germany's market economy resulted in an apparent jump in the nation's R&D effort in 1991, only to have been scaled back since in an effort to restructure and close inefficient, inappropriate, and redundant research institutions.¹⁷

R&D/GDP RATIOS

Due to the size of its economy, the United States spends more on R&D than any other country, though it does not spend as high a proportion of its economy on R&D as some other countries.¹⁸ In 1996 the most recent year for which comparable international data are available, the United States spent 2.57 percent of its GDP on R&D, compared to 2.77 percent spent by Japan in 1995 (the latest year's data available for that country), 2.32 percent by France, 2.28 percent by Germany, 1.94 percent by the United Kingdom, 1.66 percent by Canada, and 1.03 percent by Italy.

During the early to mid-1960s, the United States ranked highest among these countries in the R&D/GDP ratio. After 1964, however, the U.S. ratio began to decline, as Federal R&D spending for defense and space was cut back while the U.S. GDP continued to increase. At the same time, the ratios of other countries—notably (West)

Germany and Japan—slowly increased. These trends continued until the late seventies, when the U.S. ratio had dropped to 2.2 percent and was roughly equal to those of (West) Germany, the United Kingdom, and Japan.

From the late seventies through the early eighties, the ratios in all of the industrialized countries just mentioned were again increasing, and by 1985 they had reached 2.74 percent for the United States, 2.72 percent for (West) Germany, 2.58 percent for Japan, 2.23 percent for the United Kingdom, and 2.25 percent for France. (See figure 9 and appendix table B-30). Since 1985, the R&D/GDP ratios of each of these countries have fluctuated within narrow ranges. Japan's ratio peaked at 2.85 percent in 1990 and then dipped back to 2.63 percent in 1994. The ratio for Germany peaked at 2.88 percent in 1987 but has since declined to 2.28 percent by 1996—a result, in part, of the reunification of Germany and its subsequent effects on official statistics. The R&D/GDP ratio for France rose continually from 1.97 percent in 1981 to a peak of 2.45 percent in 1993, but then fell to 2.32 percent by 1996, the lowest it has been since 1988. The British ratio remained between 2.11 and 2.25 from 1983–94, but since dropped to 1.94 percent by 1996.

Separation of R&D into defense and non-defense activities allows for the examination of the ratio of non-defense R&D to total GDP. In 1996, the most recent year for complete data, the United States had a non-defense R&D/GDP of 2.11 percent. This ratio was lower than for Germany (2.20) and Japan (2.73 in 1995), but higher than for France (2.04 in 1995), the United Kingdom (1.71), Canada (1.63), and Italy (0.98 in 1995). In 1995, the last year for which Japanese data are available, roughly 99 percent of Japanese R&D was devoted to nondefense activities, as compared with 81 percent for the United States.

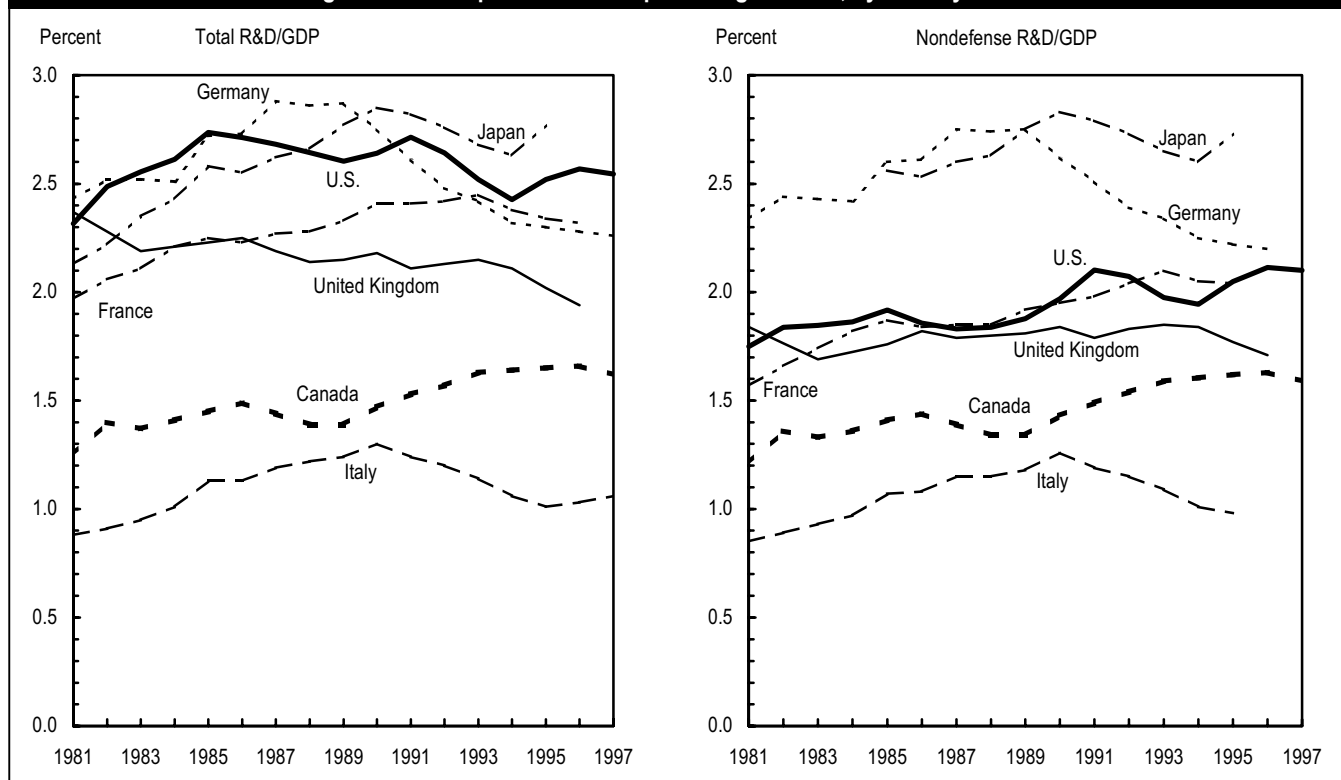
R&D SCIENTISTS AND ENGINEERS/ LABOR FORCE RATIOS

The estimated number of scientists and engineers employed in full-time-equivalent (FTE) R&D jobs, as a proportion of the total labor force, is higher in the United States and Japan than in the other industrialized market economies. For the United States, FTE R&D scientists and engineers (S&Es) as a percent of the labor force tended to rise between 1981 and 1991, from 0.62–0.76 percent, but has remained at 0.75 percent in 1993 and 1995 (the last year for which such data are currently

¹⁷ For more detailed discussion of these changes, see National Science Board, *Science and Engineering Indicators—1998*. Arlington, VA: National Science Foundation, 1998 (NSB 98-1), pp. 4-35–4-55.

¹⁸ Besides Japan (mentioned below), Sweden and Switzerland have also had higher R&D/GDP ratios than the United States. See, for example, National Science Foundation, *Human Resources for Science and Technology: The European Region*, NSF 96-316, Special Report, Arlington, VA, 1996.

Figure 9. R&D expenditures as a percentage of GDP, by country: 1981–97



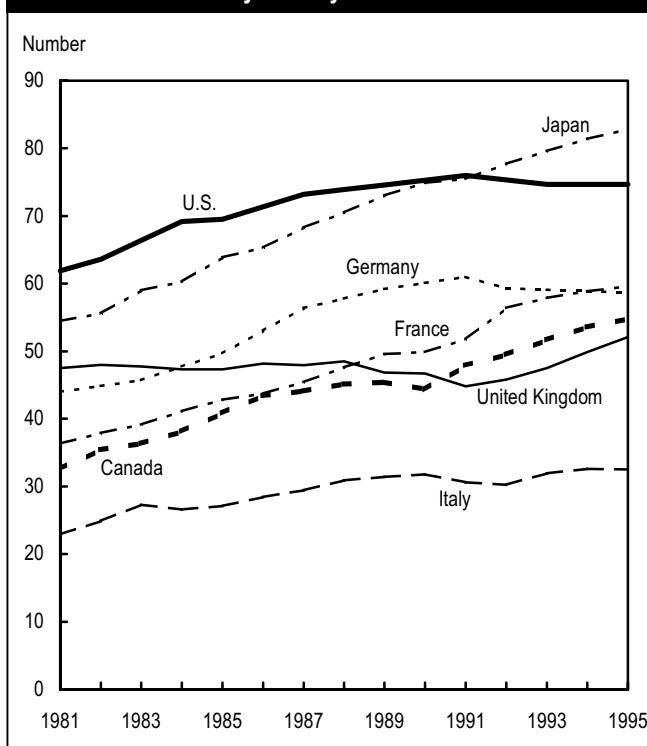
SOURCE: National Science Foundation/Division of Science Resources Studies, table B-30.

available). In 1993 Japan, with 0.80 percent, exceeded the United States in the percent of all employees that are R&D S&Es. This difference in the R&D S&E ratio between the United States and Japan is in sharp contrast to earlier values (figure 10). For example, in 1981, the percent was 0.62 for the United States and 0.55 for Japan.¹⁹

France and Germany also experienced significant increases: France from 0.36 percent in 1981 to 0.58 percent in 1993, and Germany from 0.44 percent in 1981 to 0.59 percent in 1992 and again in 1995. In Canada, R&D S&Es increased from 0.33 percent of the labor force in 1981 to 0.55 percent in 1995. In contrast, the United Kingdom and Italy experienced relatively slower growth in this percentage, the U.K. growing from 0.48 percent in 1981 to 0.52 percent in 1995, and Italy growing from 0.23 percent in 1981, to 0.31 in 1988, but then increasing to only 0.33 percent by 1995.

¹⁹ Japanese and U.S. surveys on the number of scientists and engineers engaged in R&D are not strictly comparable. Estimates for most of the U.S. data are adjusted to estimate full-time equivalence; Japanese surveys, on the other hand, ask for the total number of S&Es engaged in R&D regardless of the amount of time devoted to R&D. Japanese data on scientists and engineers exclude those engaged in R&D in the social sciences. The U.S. data exclude such personnel from the industry sector alone. The historical series for these U.S. personnel data was revised in this *National Patterns*. Data for 1985 and later years are not directly comparable with the data for 1984 and earlier years. See appendix A for a review of these changes.

Figure 10. Scientists and engineers engaged in R&D per 10,000 labor force, by country: 1981–95



SOURCE: National Science Foundation/Division of Science Resources Studies, table B-29.

NATIONAL R&D PERFORMANCE PATTERNS—

BY SECTOR

OVERVIEW

The sectoral shares of U.S. R&D performance, measured in terms of expenditures, have shifted significantly since the early 1980s. In 1980, industry—including industry-administered Federally Funded Research and Development Centers (FFRDCs)—performed 70.6 percent of the Nation's R&D; the academic sector (including academically administered FFRDCs) accounted for 13.6 percent; the Federal Government, 12.4 percent; and the nonprofit sector (including nonprofit-administered FFRDCs), 3.4 percent. As industry's defense-related R&D efforts accelerated in the early eighties, its share of the performance total rose to 73.7 percent in 1985.

From 1985–94, R&D performance grew by only 1.1 percent per year in real terms for all sectors combined. This growth was not evenly balanced across sectors, however. R&D performance at universities and colleges (including their FFRDCs) grew by 4.3 percent per year in real terms, compared with only 0.7-percent growth for industry, a decline of 0.7 percent per year for Federal intramural performance, and growth of 3.0 percent per year for nonprofit organizations (including their FFRDCs).

The period from 1994–98 witnessed dramatic changes in these growth rates, according to preliminary estimates. Total R&D performance, in real terms, averaged 4.7 percent growth per year, which was substantially higher than in the earlier sluggish period. Yet R&D performance at universities and colleges (including their FFRDCs) grew by only 1.8 percent per year in real terms, i.e., a lower growth rate. Industry (including their FFRDCs) grew at a remarkable rate of 6.2 percent in real terms, as if to make up for lost time in the earlier period. Federal intramural performance, in contrast, experienced twice the rate of decline it had experienced earlier—a loss of 1.4 percent per year in real terms. Finally, nonprofit organizations (including their FFRDCs), were estimated to increase by only 1.1 percent per year in real terms from 1994–98.

According to preliminary estimates, these shifts in growth have led, in 1998, to academia (including FFRDCs) representing 14.1 percent of total U.S. R&D performance, Federal intramural activities 7.7 percent, other nonprofit

organizations (including FFRDCs) 3.1 percent, and private industry (including FFRDCs) 75.1 percent (table 5).

INDUSTRY

By preliminary estimates, R&D performance by private industry reached \$165.7 billion in 1998, including \$2.4 billion spent by FFRDCs administered by industrial firms. This total represents a 6.5-percent increase over the 1997 preliminary total in real terms (figure 11). That 1997 total of \$152.7 billion reflects a smaller, though still notable, real gain of 3.5 percent over 1996.

In 1998, R&D performed by industry that was not federally financed rose 7.7 percent in real terms above its 1997 level, according to preliminary data. Overall, these data imply that private companies (excluding industry-administered FFRDCs) funded 86.2 percent (\$140.8 billion) of their 1998 R&D performance, with the Federal Government funding nearly all the rest (\$22.5 billion, or 13.8 percent of total). Preliminary figures also indicate little or no change, in real terms, in Federal funds for these industrial R&D activities between 1997 and 1998. As recently as 1987, the Federal funding share of industry's performance total (excluding FFRDCs) was 31.9 percent; however, the Federal share of industry's performance has been steadily declining since its peak of 56.7 percent reached in 1959.

Individual industries show very different R&D performance trends and shares of the industry R&D total since the early eighties. R&D performance by aircraft manufacturers and spacecraft/guided missiles manufacturers (SIC codes 372 & 376, respectively) has been the most volatile, representing, for example, 25 percent of total industry R&D performance in 1988, but only 11 percent in 1996 (table 6). These movements can be explained, in part, by parallel shifts in Federal defense-related funding during the period.

The industrial sector that appears to have undergone the fastest growth in non-federally funded R&D is lumber, wood products, and furniture, which increased its own R&D expenditures from \$144 million in 1986 to \$634 million in 1996, reflecting a real annual growth in

Table 5. Projected levels of intersectoral transfers of funds for performance of R&D: 1998

Character of work/ sources of funds	Performer						Percent distribution by sources
	Federal Government	Industry 1/	Universities and colleges	U&C associated FFRDCs 2/	Other nonprofit institutions 1/	Total	
	[Millions of current dollars]						
Total R&D							
Federal Government.....	16,936	24,899	15,247	5,529	4,026	66,636	30.2
Industry.....	..	140,847	1,829	..	1,038	143,714	65.1
Universities and colleges.....	..	..	6,819	..	..	6,819	3.1
Other nonprofit institutions.....	..	..	1,778	..	1,671	3,449	1.6
Total.....	16,936	165,746	25,672	5,529	6,735	220,617	100.0
Percent distribution, performers.....	7.7%	75.1%	11.6%	2.5%	3.1%	100.0%	
Basic research							
Federal Government.....	2,867	1,429	11,009	2,688	1,529	19,523	56.7
Industry.....	..	7,161	1,157	..	478	8,795	25.5
Universities and colleges.....	..	..	4,314	..	..	4,314	12.5
Other nonprofit institutions.....	..	..	1,125	..	668	1,793	5.2
Total.....	2,867	8,590	17,606	2,688	2,675	34,426	100.0
Percent distribution, performers.....	8.3%	25.0%	51.1%	7.8%	7.8%	100.0%	
Applied research							
Federal Government.....	5,135	4,075	3,024	1,562	1,116	14,911	30.0
Industry.....	..	30,748	551	..	353	31,652	63.6
Universities and colleges.....	..	..	2,054	..	..	2,054	4.1
Other nonprofit institutions.....	..	..	535	..	602	1,137	2.3
Total.....	5,135	34,823	6,164	1,562	2,071	49,753	100.0
Percent distribution, performers.....	10.3%	70.0%	12.4%	3.1%	4.2%	100.0%	
Development							
Federal Government.....	8,934	19,395	1,213	1,279	1,381	32,202	23.6
Industry.....	..	102,939	121	..	208	103,268	75.7
Universities and colleges.....	..	..	451	..	..	451	0.3
Other nonprofit institutions.....	..	..	118	..	401	519	0.4
Total.....	8,934	122,334	1,902	1,279	1,990	136,438	100.0
Percent distribution, performers.....	6.5%	89.7%	1.4%	0.9%	1.5%	100.0%	

1/ Expenditures for FFRDCs administered by both industry and nonprofit institutions are included in the totals of their respective sectors. They are estimated to account for less than 2 percent and 12 percent, respectively, of the industry and nonprofit institutions performance totals. FFRDCs are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and training purposes.

2/ FFRDCs administered by individual universities and colleges and by university consortia.

KEY: FFRDC = Federally funded research and development center

NOTE: State and local government funds are included in industry funds reported to industry performers, and in university and college funds reported to university and college performers. Detail may not add to totals due to rounding.

SOURCE: National Science Foundation/Division of Science Resources Studies, appendix tables B-1, B-2, B-3 and B-4.

**Table 6. Industrial R&D performance, by type of industry:
1984, 1988, 1992, and 1996**

Industry	Year			
	1984	1988	1992	1996
	[Millions of current dollars]			
Total industrial R&D performance	74,800	97,015	119,110	144,667
	[Percent]			
Distribution by industry				
Drugs and medicines (283).....	4	5	7	7
Industrial and other chemical (28, excluding 283).....	6	6	6	6
Petroleum refining and extraction (13, 29).....	3	2	2	1
Machinery and computers (35)....	14	13	13	9
Electrical equipment (36).....	18	15	11	16
Aircraft and missiles (372, 376).....	25	25	14	11
Other transportation (37, excluding 372, 376).....	10	11	9	11
Professional and scientific instruments (38).....	6	6	8	8
Other manufacturing industries....	7	6	6	8
Nonmanufacturing industries.....	7	11	24	23

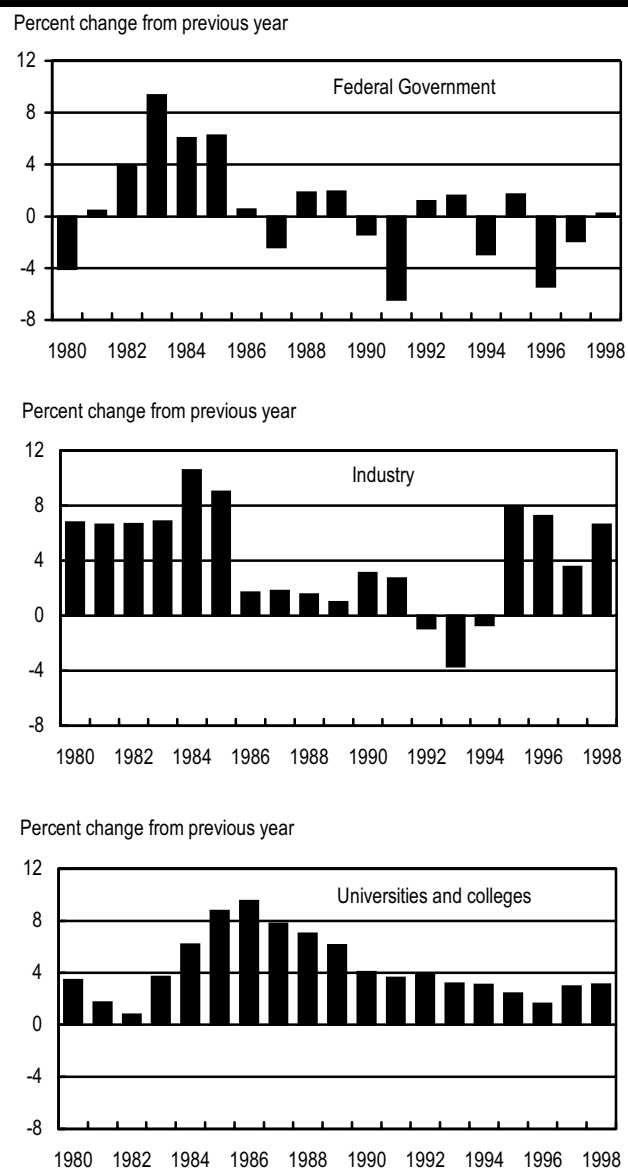
NOTE: Numbers in parentheses are SIC codes. As a result of changes in the underlying survey design, data for 1992 and 1996 are not directly comparable with those for earlier years. See accompanying text and appendix A.

SOURCE: National Science Foundation/Division of Science Resources Studies, table B-16 and *National Patterns of R&D Resources 1996*, NSF 96-333, table C-26.

R&D of 12.4 percent.²⁰ (See table 4.) However, this finding should be read cautiously, especially in view of the fact that there was relatively little R&D in the industry to begin with, making it easy for a high growth rate to be achieved without necessarily reflecting inherent aspects of the industry that would favor new R&D. The same caution might also be advised in the interpretation of R&D growth for the paper and allied products industry, which rose substantially from \$538 million in 1986 to \$1,534 million in 1996, reflecting the second-highest real growth, among the industrial categories examined, of 7.6 percent.

²⁰ Although they had the highest R&D growth rates, the sectors “other manufacturing industries” and “other nonmanufacturing industries” are not entered into this discussion for two reasons: First, as noted in table 4, their definitions (i.e., what firms they include) have changed over the course of the time period in question, making it inappropriate to interpret their growth as a true change in their economic resources devoted to R&D. Furthermore, their definitions, even at a single point in time, are obscure, as each they represent an enormous variety of activities. Consequently, any observation of their R&D growth would offer little understanding of how or why such growth occurred.

**Figure 11. Changes in national R&D spending,
by performer: 1980–98 (based on
constant 1992 dollars)**



NOTE: Data are preliminary for 1997 and 1998.

SOURCE: National Science Foundation/Division of Science Resources Studies, table B-1A.

Industries with at least \$1 billion in R&D in 1986 would be expected, on average, to have growth rates in R&D that are less subject to chance (i.e., less subject to circumstances unrelated to the potential effectiveness of their R&D). Among these seven industries, excluding the more obscure categories of “other manufacturing industries” and “nonmanufacturing industries,” electrical equipment (which includes computer chips for example) had the highest real annual growth rate of 4.3 percent. It is followed by chemicals and allied products (4.0 percent), professional and scientific instruments (2.4 percent), and

transportation equipment (including aircraft and missiles) (1.0 percent). Machinery, which includes computer and office equipment, experienced a real reduction in R&D of -0.9 percent per year between 1986 and 1996, although this is largely explained by the reclassification of several major R&D performing firms from this industry in 1986 to computer software (SIC 737) in 1996. Also experiencing reductions in real R&D were food, kindred, and tobacco products (-1.1 percent) and petroleum refining and extraction (-4.9 percent).

Federal financing for industrial R&D, including industry FFRDCs, has varied markedly across both time and different industries. The Federal Government provided \$23.7 billion for industry R&D in 1996, the most recent year for which detailed data by industrial category are available. Aerospace companies (or the industrial sector “aircraft and missiles”) alone received 44 percent of all Federal R&D funds provided to all industries. Consequently, 65 percent of the aerospace industry’s R&D dollars came from Federal sources, while the remaining 35 percent came from companies’ own funds (figure 12). In comparison, the drugs and medicines sector in 1996 financed 100 percent of its R&D from company funds; machinery 99 percent; professional and scientific instruments 68 percent, transportation equipment other than aircraft and missiles 90 percent, business services 97 percent, and engineering and management services 62 percent.²¹

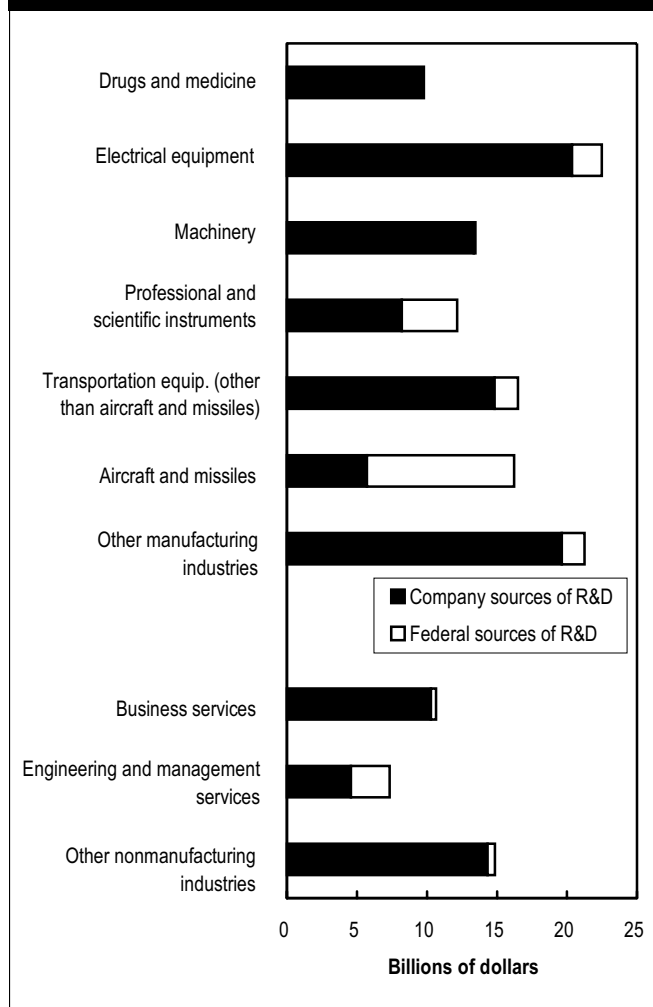
FEDERAL GOVERNMENT

The Federal Government, excluding FFRDCs, will perform \$16.9 billion of the total 1998 U.S. R&D in 1998, based on preliminary estimates. This figure is slightly higher than the level estimated for 1997, \$16.6 billion, which reflects only 0.2-percent growth after adjusting for inflation. Federal agencies account for 7.7 percent of the projected 1998 national R&D performance effort, continuing the trend begun in 1972, in the gradual decline of Federal performance as a percent of total R&D.

The Department of Defense (DoD) continues to perform more Federal intramural R&D than any other Federal agency; in fact, it performs more than twice the R&D of the next-largest R&D-performing agency, the Department of Health and Human Services (HHS)

²¹ The 100 percent company funding for the drugs and medicines sector does not include the indirect support for R&D that NIH ultimately provides to this sector.

Figure 12. Industrial R&D performance, by industry and source of funds: 1996



SOURCE: National Science Foundation/Division of Science Resources Studies, table B-21.

(whose intramural R&D is performed by the National Institutes of Health) (table 3). However, according to preliminary tabulations, DoD’s intramural R&D performance declined substantially between FYs 1997 and 1998, down 12.9 percent in real terms, to a projected FY 1998 level of \$7.7 billion. Furthermore, an undetermined amount of DoD’s intramural R&D ultimately appears to be contracted out to other extramural performers. NASA’s intramural R&D grew slightly, by 1.2 percent in real terms by preliminary FY 1998 estimates, to \$2.3 billion, while the HHS rose by only 0.5 percent in real terms, to \$2.9 billion.²² Together, these three agencies account for

²² This increase represents the overall effect on intramural R&D for the agency, which takes into account the Social Security Administration (SSA) becoming a separate agency from HHS during fiscal year 1995. That is, the percent increase reported would be larger, though negligibly, if HHS in 1995 were defined as not including SSA, as it is in 1996.

76.1 percent of the total (\$16.8 billion), estimated Federal intramural R&D for FY 1998 (table 3).

Total R&D performed by industrial, academic, and nonprofit FFRDCs, combined, is expected to reach \$8.8 billion in 1998, which is essentially the same as its preliminary level of \$8.6 billion in 1997, after adjusting for inflation. R&D at FFRDCs account for 4.0 percent of the national R&D effort, most of which (\$5.5 billion in 1998) is accounted for by university and college administered FFRDCs.

Until 1979, the Federal Government had been the second-largest R&D performer in the Nation after the industrial sector. Its share of the national R&D performance total, however, fell from 16 percent in 1970 to 12 percent in 1980. This reduction was due primarily to cutbacks in space R&D programs: NASA funds for intramural R&D performance were reduced by more than one-half in real terms during this period. As a result, in 1979 the academic sector—including associated FFRDCs—surpassed the Federal Government in terms of its share of national R&D performance.

UNIVERSITIES AND COLLEGES

Universities and colleges (excluding academically-administered FFRDCs, which are discussed separately below) are expected to account for 11.6 percent (\$25.7 billion) of the 1998 national R&D performance effort. This total implies that they have experienced moderate, real growth of R&D by 3.1 percent from the year before.

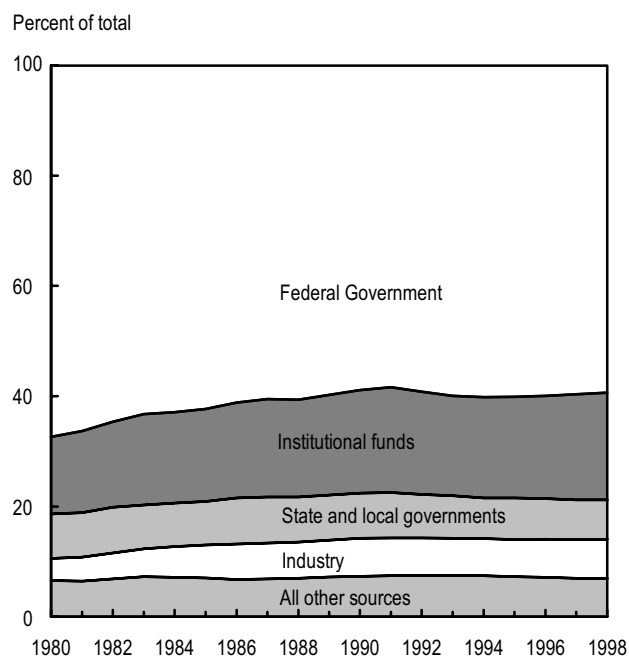
Unlike the industry and Federal sectors, the academic sector's overall R&D performance increased rapidly throughout the mid-1980s and continued to grow, though less rapidly, in the early 1990s (figure 11).²³ From 1980–85, real growth averaged 4.2 percent annually. Whereas real increases in the R&D performance of other sectors slowed considerably in the period from 1985–94, universities and colleges experienced a 5.3-percent real, annual growth. Finally, from 1994–98, by preliminary estimates, R&D performed in academia slowed, growing at a real rate of 2.5 percent per year.

²³ These academic R&D data are for separately budgeted expenditures only. Consequently, they exclude that portion of salaries for research time or other research expenses financed by funds not specifically earmarked for R&D from state and local governments and other non-federal sources, including endowments.

The Federal Government has long provided the largest share of the R&D funds used by universities and colleges. In the early 1980s, Federal funds accounted for roughly two-thirds of the academic total. By 1991, however, this share had dropped to a low of 58 percent and has remained between 59 and 60 percent since then (figure 13).

Between 1985 and 1994, the academic share of total U.S. R&D performance grew from 8.7 percent to 12.7. By 1994, federally financed academic R&D (\$12.8 billion) had grown by 4.9 percent per year in real terms since 1985, and university and college R&D performance using non-federal funds (\$8.4 billion in 1994), had grown by 6.0 percent in real terms. During this period, the links between academic and industrial R&D had expanded considerably. Industry's academic R&D funding increased by 6.7 percent per year in real terms from 1985–94, although in 1994 it accounted for just 6.7 percent (\$1.4 billion) of academia's 1994 R&D total (excluding FFRDCs). Universities' own institutional funds—the largest non-federal source—had grown by 6.3 percent per year in real terms between 1985 and 1994, and by 1994 accounted for 18.3 percent (\$3.9 billion) of their

Figure 13. University and college R&D performance, by source of funds: 1980–98



NOTES: State and local government funds exclude general purpose appropriations that universities use at their discretion for R&D. Such funds are included in the institutional funds total.

SOURCE: National Science Foundation/Division of Science Resources Studies, table B-1A.

total R&D expenditures. Real R&D funds from state and local governments grew by 4.5 percent per year in real terms over this period, and by 1994 represented 7.4 percent (\$1.6 billion) of academic R&D.

In the period 1994–98, by preliminary tabulations, the academic share of total U.S. R&D had dropped from 12.7 to 11.6 percent. Federal funds for academic R&D (excluding FFRDCs) had grown in real terms by 2.2 percent per year to a preliminary level of \$15.2 billion. Non-federal funds for academic R&D grew by 3.0 percent, to \$10.4 billion. Among these non-federal funds, industry's contribution to academic R&D rose in real terms by 4.1 percent per year, to \$1.8 billion in 1998 by preliminary estimates, while universities' own funds rose by 4.0 percent per year in real terms, to \$5.0 billion in 1998. R&D funding from state and local governments for academic R&D performance grew by 1.8 percent per year in real terms, to \$1.8 billion by 1998 according to preliminary tabulations. As a result, the shares of funding to academic R&D in 1998 were estimated to be 59.4 percent from the Federal Government, 7.2 percent from state and local governments, 7.1 percent from industry, 19.4 percent from universities' own funds, and 6.9 percent from nonprofit organizations.

The most recent year for data on university R&D expenditure by field of study is for FY 1996 (appendix table B-24). In this fiscal year, life sciences accounted for 55.2 percent of academic R&D expenditures, engineering accounted for 16.0 percent, and the physical sciences (astronomy, chemistry, physics, and related subfields) accounted for 9.8 percent. These percentages have changed little in recent years—in FY 1989, for example, life sciences accounted for 53.8 percent, engineering for 16.0 percent, and the physical sciences 11.0 percent.

ACADEMICALLY ADMINISTERED FFRDCs

R&D performance in 1998 by university-administered FFRDCs is estimated to be \$5.5 billion, or approximately 2.5 percent of the national R&D effort. These FFRDCs account for 17.7 percent of the total 1998 academic (universities and colleges plus academically administered FFRDCs) R&D performance.

From 1974–80, R&D at academically administered FFRDCs grew by 8.6 percent per year in real terms. This increase largely mirrored the Federal emphasis on energy programs. Since 1980, the Federal shift away from energy concerns has resulted in much slower growth in academically administered FFRDC R&D performance—only 1.3 percent per year in real terms.

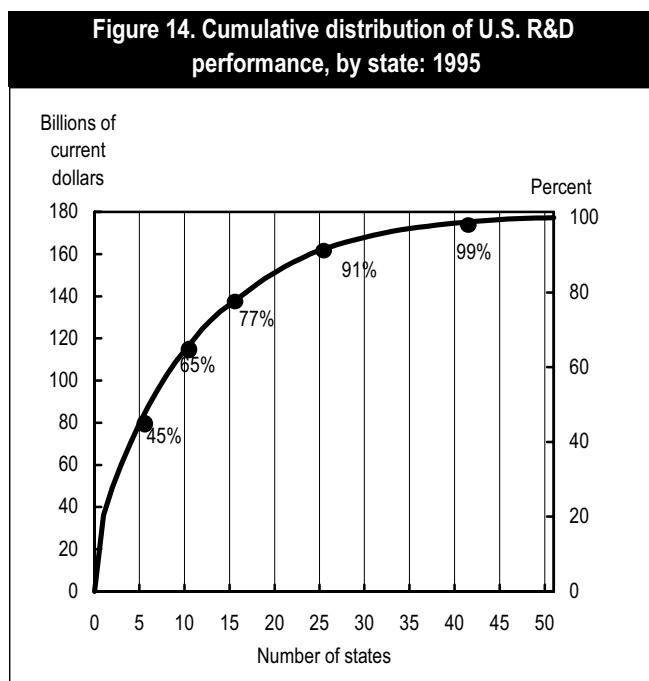
The distribution of R&D by field at university-administered FFRDCs has been quite different from the distribution of R&D at universities and colleges. In FY 1996, engineering accounted for 34.7 percent of R&D expenditures at university-administered FFRDCs (in contrast to 16.0 percent at universities and colleges), physical sciences 40.1 percent (in contrast to 9.8 percent), and life sciences 2.3 percent (in contrast to 55.2 percent). (See appendix tables B-24 and B-26.) However, like R&D at universities and colleges, these percentages have changed little in recent years—in FY 1989 engineering at university-administered FFRDCs accounted for 34.7 percent, the physical sciences 38.6 percent, and life sciences 2.8 percent.

NATIONAL R&D PERFORMANCE PATTERNS—BY STATE

The latest data available on the state distribution of R&D performance are for 1995.²⁴ These data cover R&D performance by industry, academia, and Federal agencies, along with the federally funded R&D activities of nonprofit institutions.²⁵ The state data on R&D contains 52 records: the 50 states, the District of Columbia (DC), and “other/unknown” which accounts for R&D in Puerto Rico and other non-state U.S. regions, as well as R&D for which the particular state was not known. Approximately two-thirds of the R&D that could not be associated with a particular state is R&D performed by the nonprofit sector. Consequently, the distribution of R&D by state indicates primarily where R&D is undertaken in Federal, industrial, and university facilities.

In 1995, total R&D expenditures in the United States were \$183 billion, of which \$177 billion could be attributed to expenditures within individual states, with the remainder falling under an undistributed, “other/unknown” category. (See appendix table B-8.) The statistics and discussion below refer to state R&D levels in relation to the distributed total of \$177 billion.

R&D is substantially concentrated in a small number of states. In 1995, California had the highest level of R&D expenditures—over \$36 billion—representing approximately one-fifth of the \$177 billion U.S. total. The six states with the highest levels of R&D expenditures—California, Michigan, New York, Massachusetts, New Jersey, and Texas (in descending order)—accounted for approximately one-half of the entire national effort. The top 10 states—adding, in descending order, Illinois, Pennsylvania, Maryland, and Ohio—accounted for nearly two-thirds of the national effort (figure 14 and text table 7). California’s R&D effort exceeded, by nearly a factor of three, the next-highest state, Michigan, with \$13 billion in R&D expenditures. After Michigan, R&D levels



NOTE: Includes R&D expenditures for the District of Columbia but excludes R&D that cannot be distributed by state.

SOURCE: National Science Foundation/Division of Science Resources Studies, table B-8.

declined relatively smoothly to approximately \$5 billion for Ohio. The 20 highest-ranking states in R&D expenditures accounted for about 85 percent of the U.S. total; the lowest 20 states, for 5 percent.

States that are highest in total R&D performance are usually ranked among the highest in both industrial and academic R&D performance. For example, among the top 10 for total R&D, eight states were among the top 10 for industrial R&D, and eight were among the top 10 for academic R&D, as shown in table 7.

For Federal intramural research, there was less commonality with the top 10 for total R&D. Only four states were found in both top-10 lists: Maryland, California, Ohio, and Texas. The six others in the Federal intramural list, in descending order of Federal R&D performance, were the District of Columbia, Virginia, Alabama, Florida, New Mexico, and New Jersey. Maryland ranked first among Federal R&D performers, followed by the District of Columbia, California, and Virginia. The placement of Maryland, the District of Columbia, and Virginia among the top four in Federal R&D performance reflects the concentration of Federal facilities and administrative

²⁴ Although annual data are available on the location of R&D performance by the academic and Federal sectors, NSF conducts surveys on the State distribution of industrial R&D performance only in odd-numbered years. At this writing, the 1997 industry R&D survey data have not been processed, making 1995 the most recent year for which the State-specific R&D totals can be reported.

²⁵ R&D performance data include the R&D activities in FFRDCs in each sector of the economy. For a more detailed description of these data, as well as comparisons of 1985 R&D expenditures with other economic measures (for example, population and gross state product), see NSF, *Geographic Patterns: R&D in the United States*, by John E. Jankowski, NSF 89-317 (Washington, DC, 1989).

Table 7. Leading states in total R&D performance, R&D by sector, and R&D as a percentage of gross state product (GSP): 1995

Rank	Top 10 states in total R&D performance		Top 10 states in size of R&D, by type of performer			Top 10 states in R&D intensity (states having the highest R&D/GSP ratio)		
	Total R&D [millions of current dollars]	Top 10 states 1/	Industry 2/	Universities & colleges 3/	Federal Government	Most R&D intensive	R&D/GSP [percent]	GSP [billions of current dollars]
1.....	\$36,133	California	California	California	Maryland	New Mexico	8.09%	\$40.76
2.....	13,275	Michigan	Michigan	New York	District of Columbia	District of Columbia	6.30	49.69
3.....	10,955	New York	New York	Illinois	California	Michigan	5.27	251.79
4.....	9,970	Massachusetts	New Jersey	Massachusetts	Virginia	Massachusetts	5.09	195.87
5.....	9,128	New Jersey	Massachusetts	Texas	Alabama	Maryland	5.00	137.35
6.....	8,385	Texas	Texas	New Mexico	Ohio	Delaware	4.26	26.95
7.....	7,486	Illinois	Illinois	Pennsylvania	Florida	California	3.96	913.47
8.....	6,919	Pennsylvania	Pennsylvania	Maryland	Texas	Connecticut	3.63	118.60
9.....	6,865	Maryland	Washington	Michigan	New Mexico	Rhode Island	3.58	25.05
10.....	5,315	Ohio	Florida	North Carolina	New Jersey	Washington	3.49	150.00

1/ Includes in-state R&D performance of industry, universities, associated federally funded research and development centers (FFRDCs), and Federal agencies and the federally funded R&D performance of nonprofit institutions. For these tabulations, "states" include the District of Columbia.

2/ Includes R&D activities of industry-administered FFRDCs located within these states.

3/ Includes R&D activities of university-administered FFRDCs located within these states.

SOURCES: National Science Foundation/Division of Science Resources Studies, tables B-7 and B-8, and Bureau of Economic Analysis.

offices within the national-capital area.²⁶ Alabama, Florida, and New Mexico rank among the highest in Federal R&D because of their relatively high shares of Federal space- and defense-related R&D.

States vary widely in the size of their economies, owing to differences in population, land area, infrastructure, natural resources, and history. Consequently, variation in the R&D expenditure levels of states may simply reflect differences in economic size or the nature of their R&D efforts. A simple way of controlling for the size effect is to measure each state's R&D level as a proportion of its gross state product (GSP) (appendix table B-8). That proportion is referred to as R&D "intensity" or "concentration." Overall, the Nation's total R&D to gross domestic product ratio was 2.5 percent in 1995. The top 10 rankings for R&D intensity were, in descending order, New Mexico (8.1 percent), the District of Columbia,

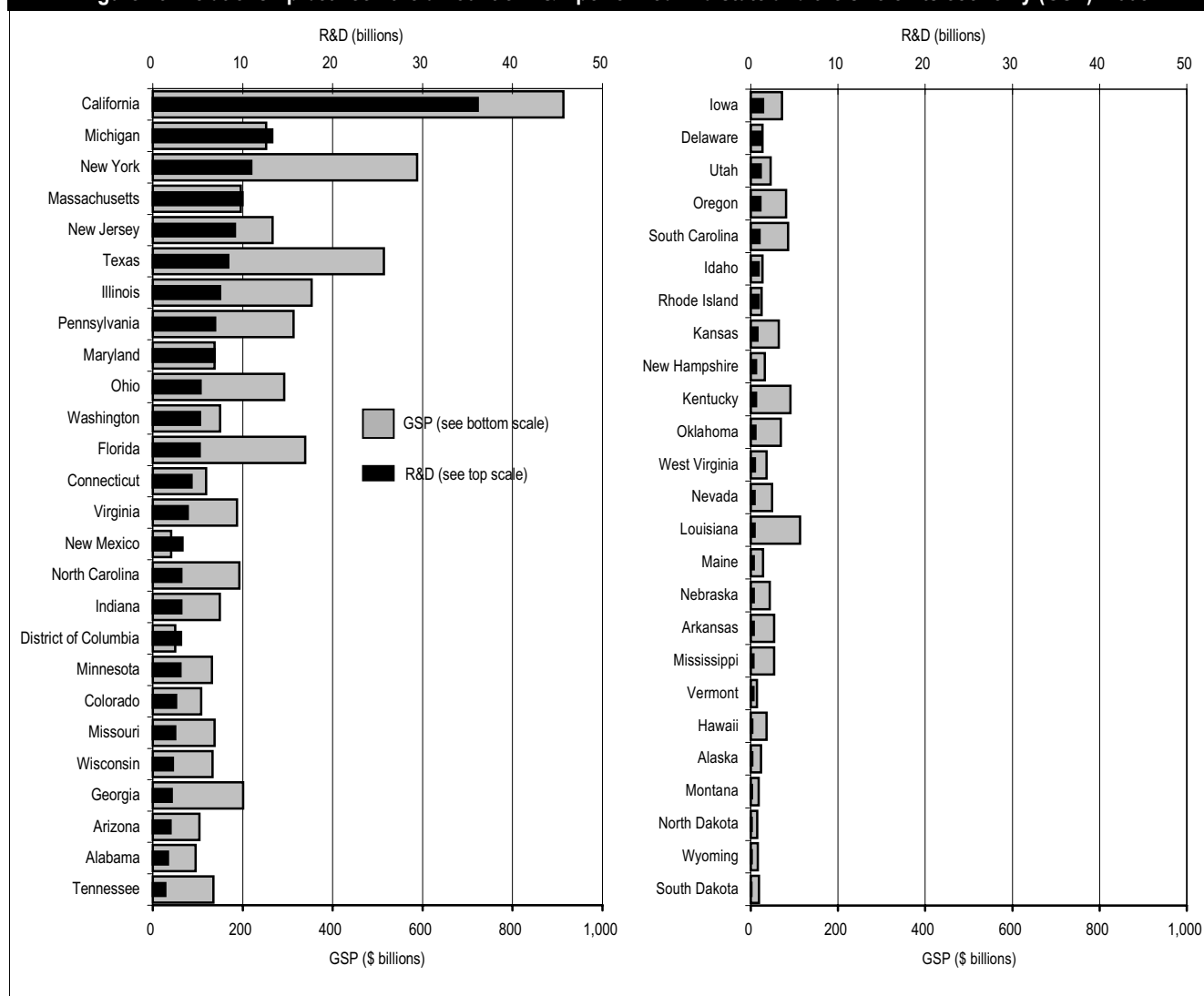
Michigan, Massachusetts, Maryland, Delaware, California, Connecticut, Rhode Island, and Idaho (the latter with an intensity of 3.5 percent). New Mexico's R&D intensity is largely attributable to Federal support to the Sandia National Laboratories and Los Alamos National Laboratory FFRDCs in the state, provided by the Department of Energy.

Figure 15 juxtaposes state R&D performance with GSP, with the 50 states and the District of Columbia ranked in descending order of R&D. R&D expenditures are displayed as a dark bar, measured on the upper axis; GSP is displayed as a wider gray bar measured on the lower axis; both are measured in billions of dollars. The two highest-ranked states in total R&D—California and Michigan—clearly show R&D levels that are relatively high in relation to their GSPs, as reflected by their presence in the top 10 list for R&D intensity (table 7).²⁷

²⁶ Federal intramural performance included the administration of extramural R&D programs.

²⁷ For additional information about the geographic distribution of R&D within the United States, see National Science Foundation, *Science and Engineering State Profiles: 1997*, by Richard J. Bennof and Steven Payson, NSF 98-315 (Arlington, VA, 1998).

Figure 15. Relationship between the amount of R&D performed in a state and the size of its economy (GSP): 1995



NOTE: Includes R&D expenditures for the District of Columbia but excludes R&D that cannot be distributed by state. States are ranked by total R&D expenditures. GSP = gross state product.

SOURCE: National Science Foundation/Division of Science Resources Studies, table B-8.

CHARACTER OF WORK

The Nation spent an estimated \$34.4 billion on the performance of basic research in 1998, \$49.8 billion on applied research, and \$136.4 billion on development (figure 16). These totals represent noticeable increases from preliminary estimates of 1997 levels: a 2.4-percent increase, in real terms, for basic research; a 6.2-percent increase for applied research; and a 5.8-percent increase for development. As a share of all 1998 projected R&D performance expenditures, basic research represents 15.6 percent, applied research 22.6 percent, and development 61.8 percent.

The expected 1998 percentage shares differ only slightly from those reported for 1980. Basic research then accounted for 13.7 percent, applied research for 21.8 percent, and development for 64.5 percent. The methodology for imputing character-of-work estimates for industry's R&D performance, however, was changed for 1986 and later years. Consequently, data after 1985 are not strictly comparable with data for 1985 and earlier years. The revised approach resulted in relatively higher estimates for basic and applied research and lower estimates for development expenditures. Furthermore, the improved sampling of industry's R&D activity beginning in 1992 also resulted in notably higher basic research

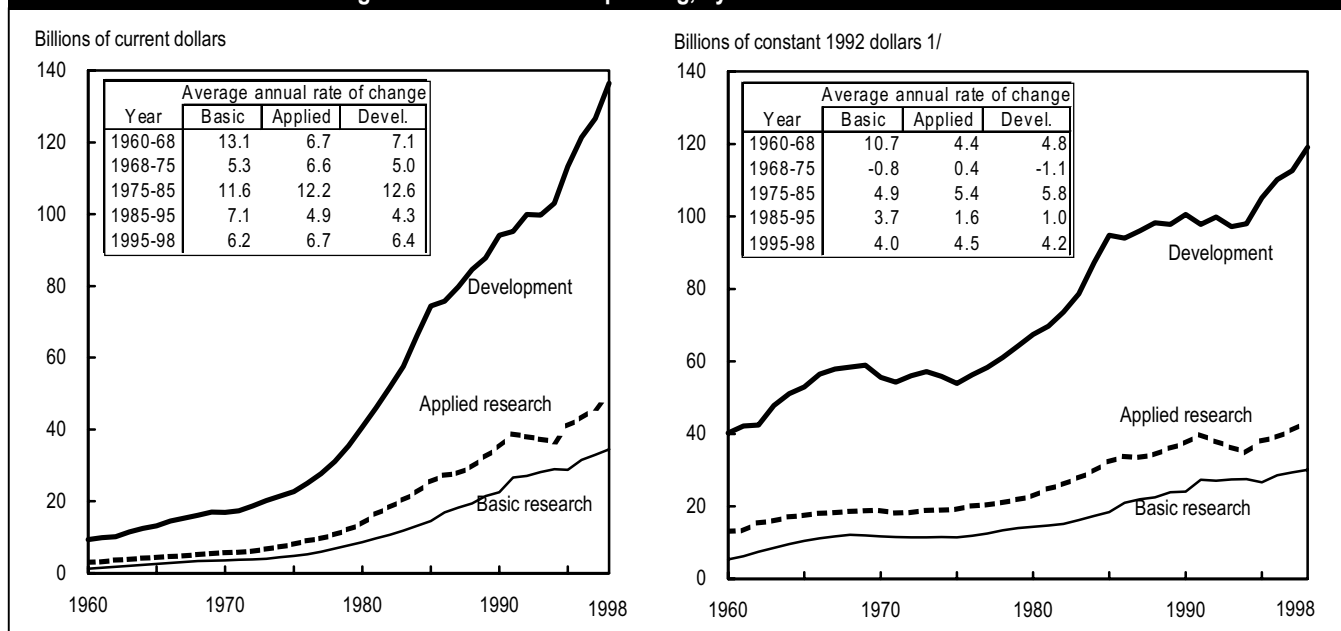
estimates than had previously been represented. (See appendix A for further details.)

BASIC RESEARCH

The average annual real growth in basic research performance was 5.2 percent between 1980 and 1985, 4.5 percent between 1985 and 1994, and 2.2 between 1994 and 1998 (by preliminary estimates for 1998).

In terms of support, the Federal Government provided the majority of funds used for basic research. However, the Federal share of funding for basic research dropped as a percent of all funding, from 70.4 percent in 1980 to a preliminary 56.7 percent (\$19.5 billion) in 1998. This decline does not reflect a decline in Federal funding for basic research, which in fact, grew an estimated 3.0 percent per year in real terms between 1980 and 1998. Rather, the decline in the Federal share of basic research reflects an increased tendency for the funding of basic research to come from other sectors. Specifically, from 1980–98, non-federal support for basic research grew at the remarkable rate of 6.4 percent per year in real terms, by preliminary estimates.

Figure 16. National R&D spending, by character of work: 1960–98



1/ Based on GDP implicit price deflator.

SOURCE: National Science Foundation/Division of Science Resources Studies; table B-6.

With regard to performance, universities and colleges (excluding FFRDCs) account for the largest share (51.1 percent) of the projected basic research total for 1998. When the performance of university-administered FFRDCs is included, the academic sector's share climbs to 58.9 percent. In 1998, basic research performance of universities—excluding FFRDCs—reached an estimated \$17.6 billion in current dollars, representing a 3.3-percent increase from 1997 in real terms. By preliminary calculations, the Federal Government provided 62.5 percent of the basic research funds used by the academic sector in 1998. Non-federal sources—including industry, state and local governments, universities and colleges themselves, and nonprofit organizations—provided the remaining 37.5 percent.

APPLIED RESEARCH

The estimated average annual real growth in applied research performance was 7.3 percent between 1980 and 1985, 0.8 percent between 1985 and 1994, and 5.6 percent between 1994 and 1998 (by preliminary estimates for 1998). Increases in industrial support for applied research were behind much of this growth. Industrial support accounted for 63.6 percent (\$31.7 billion) of the 1998 preliminary total for applied research, and Federal support for 30.0 percent (\$14.9 billion).

During the eighties, Federal support for applied research had been intentionally deemphasized in favor of support for basic research. Even with the current administration's increased support of generic/precompetitive applied research, preliminary estimates of Federal support in 1998 for applied research were only 76.3 percent of that for basic research (\$14.9 billion vs. \$19.5 billion, respectively), as reported by research performers.

Preliminary calculations indicate that 70.0 percent (\$34.8 billion) of the Nation's applied research was performed by industry and industry-administered FFRDCs in 1998. Non-federal sources accounted for

most (\$30.7 billion) of these funds, while Federal sources provided the rest (\$4.1 billion).

For the Nation's nonindustrial applied research in calendar year 1998, preliminary data indicate most was performed by universities and colleges and their administered FFRDCs (\$7.7 billion) and the Federal Government (\$5.1 billion). Approximately 18.9 percent of the projected Federal intramural applied research in FY 1998 was performed by DoD, another 24.4 percent by HHS, and 10.9 percent by NASA.²⁸ Total Federal applied research performance has been remarkably level over the past 32 years, experiencing only a 0.4-percent average annual growth, in real terms, since 1966.

DEVELOPMENT

Since R&D expenditures are primarily expenditures on development, historical patterns of development expenditures mirror historical patterns of total R&D expenditures. From 1980–85, development grew on average by 7.0 percent per year in real terms as larger shares of the national R&D effort were directed toward defense R&D, which tends to be approximately 90 percent development. Between 1985 and 1994, on the other hand, development in real terms grew at an average annual rate of only 0.4 percent, from \$74.4 billion in 1985 to \$103.0 billion in 1994. Between 1994 and 1998, by preliminary estimates, annual growth was back up to 5.0 percent in real terms, to \$136.4 billion in 1998, of which 75.7 percent was supported by industry and 23.6 percent by the Federal Government. In terms of performance, industry (including industrial FFRDCs) accounted for 89.7 percent (\$122.3 billion) of the Nation's 1998 development activities, the Federal Government 6.5 percent (\$8.9 billion), and all other performers 3.8 percent (\$5.2 billion).

²⁸ These percentages were derived from preliminary Federal obligations as reported in NSF, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*, NSF 98-332.

R&D SCIENTISTS AND ENGINEERS

NSF sponsors a variety of surveys designed to collect data on the human resources devoted to science and technology in the United States, including information on worker inputs for R&D. Surveys directed at *employers or institutions* focus on the amount of time devoted to the performance and management of R&D. These data are reported in terms of person-years, or full-time equivalent (FTE) R&D jobs. Surveys directed at *individuals* collect data on self-reported primary work activity; that is, the activity on which a scientist/engineer spends the largest proportion of time but that is not necessarily full-time. The 1994 *National Patterns* was the first to include revised estimates of the total number of scientists and engineers (S&Es) engaged primarily in R&D activities. The national totals include an FTE count of S&Es employed by industry, the total number of Federal employees whose primary work activity is research or development, an FTE estimate of graduate students' research activity, and the number of doctorate-holding S&Es working in educational or nonprofit organizations who self-report their primary work activity as research, development, or (up to 1993) the management of R&D work. These concepts are further described in appendix A.

NATIONAL ESTIMATES OF R&D SCIENTISTS AND ENGINEERS

Approximately 987,700 scientists and engineers were employed in 1995 on R&D activities in the United States (appendix table B-27). This figure reflects an annual growth rate of 1.3 percent from the 1993 level of 962,700. It reflects a 2.1-percent annual growth rate over the 1985 figure of 801,900, the first year for which revised national tabulations have been derived.²⁹

In 1995, industry employed 79.9 percent of these R&D personnel. Transportation equipment accounted for 17.6 percent of the industry total (789,500), and nonmanufacturing for 27.0 percent. This stands in sharp contrast to only eight years earlier, 1987, when the transportation equipment industry had nearly twice as many R&D S&Es as nonmanufacturing (187,800 versus 99,200, respectively). The Federal Government employed 5.5 percent

(53,900) of the Nation's R&D S&Es in 1995, while the academic and nonprofit sectors accounted for the rest.

In 1981, the number of scientists and engineers engaged in R&D per 10,000 labor force was just under 62. This ratio climbed continually through the 1980s, reached a peak of 76 per 10,000 in 1991, and has not changed significantly since then.

These personnel estimates make it possible to gain a rough perspective on the changing cost of doing research. In 1985, the Nation spent an average of approximately \$143,000 on R&D per R&D scientist and engineer, which includes salaries, fringe benefits, materials, supplies, and overhead for R&D activities. By 1995, this cost rose at roughly the same rate as inflation to \$185,000. (See appendix table B-23 for industry-specific ratios.)

SURVEYS OF DOCTORAL SCIENTISTS AND ENGINEERS

In 1995, the latest year for available data, there were approximately 484,780 doctoral scientists and engineers employed in the United States (appendix table B-28). This total represents a 2.5-percent annual growth over the 344,000 reported for 1981. Holders of doctorates in sciences in 1995 greatly outnumbered holders of doctorates in engineering, 406,130 versus 78,650 respectively, with the number for sciences including 143,390 under "social and related sciences."

Forty-one percent of all science and engineering doctorate-holders reported R&D as their primary work activity in 1995. Basic research, as a primary activity, accounted for 13.7 percent of all scientists and engineers holding doctorates; applied research 20.2 percent; development 4.9 percent; and design 2.3 percent.³⁰ Teaching as a primary activity accounted for 22.1 percent of doctoral scientists and engineers, with the remaining

²⁹ See appendix A for details on the FTE R&D scientists and engineers series.

³⁰ The category of R&D called "design" refers here to design in the context of engineering, e.g., the design of equipment, processes, structures, and prototype models, as opposed to "design" in other contexts, e.g., the design of entire research programs, expenditures, etc.

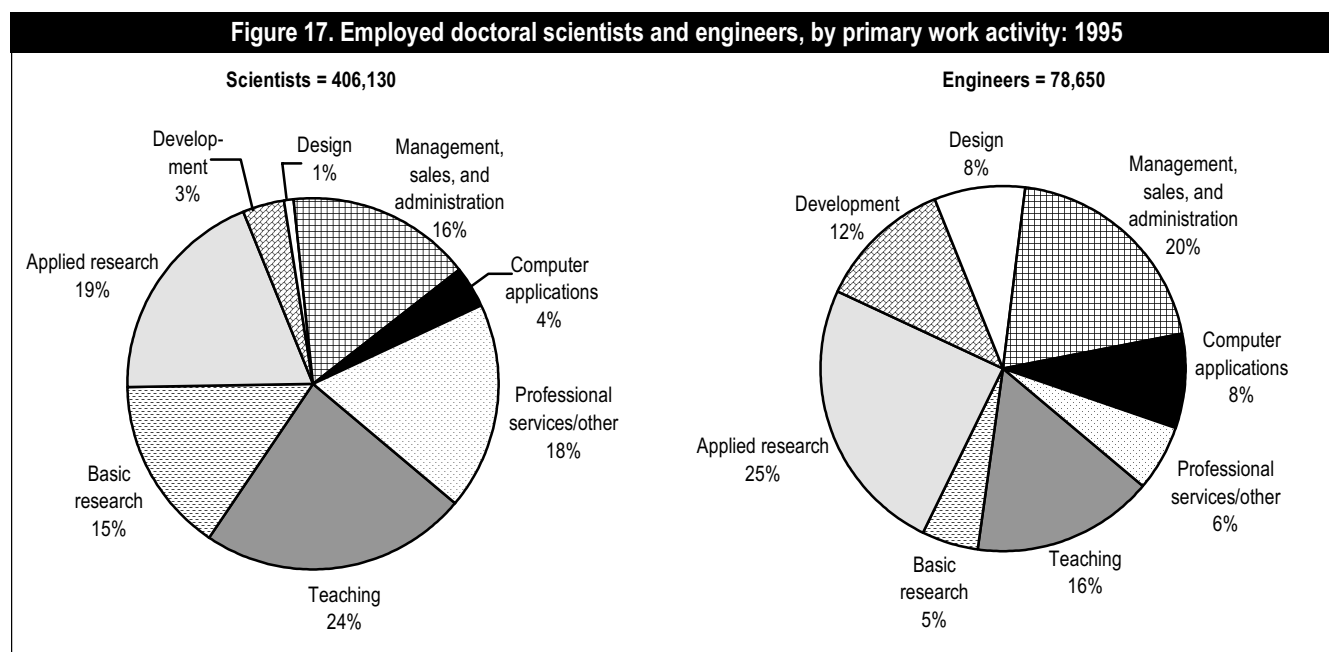
35.7 percent being distributed among management/sales/administration (16.4 percent), computer applications (4.4 percent), and professional services/other (14.9 percent)³¹.

Scientists holding doctorates in 1995 were more likely to have basic research as their primary activity (15.3 percent of all scientists hold doctorates) than engineers holding doctorates (4.9 percent). Consequently, in comparison to engineers, scientists holding doctorates were less likely to have applied research, development, or design as a their primary activity. The respective percentages

for doctoral scientists and engineers with regard to these primary activities were 19.3 percent versus 24.8 percent for applied research; 3.5 percent versus 11.9 percent for development; and 1.3 percent versus 7.9 percent for design.

Doctoral engineers reported more involvement in management, sales, and administration as a primary work activity (20.1 percent) than doctoral scientists (15.7 percent). In contrast, scientists reported more involvement in teaching than engineers, i.e., 23.2 percent versus 16.1 percent, respectively (figure 17).

³¹ This last category includes “production, operations, maintenance (e.g., truck driving, machine tooling, auto/machine repairing)” and “professional services (health care, counseling, financial services, legal services, etc.)”—see, “Survey of Doctorate Recipients, 1995”, page 5, in National Science Foundation, Division of Science Resources Studies, *Characteristics of Doctoral Scientists and Engineers in the United States: 1995*, NSF 97-319, R. Keith Wilkinson (Arlington, VA 1997).



SOURCE: National Science Foundation/Division of Science Resources Studies, table B-28.

APPENDIX A

TECHNICAL NOTES

NEW FEATURES IN THE 1998 NATIONAL PATTERNS REPORT

Symmetry of R&D tables with respect to type of performer and sources of funds. As mentioned in the General Notes, a new feature of this report is that the first four appendix tables are symmetrically arranged to allow for direct comparisons of R&D data organized in two ways: (1) by performer first and then by source, or (2) by source first and then by performer. The first case effectively asks, “what type of organization performs the R&D, and for that type of performer, from what kinds of organizations does it receive its funding?” The second case effectively asks, “what type of organization provides funding for R&D, and to which kinds of performers does it provide those funds?”

For example, the upper left-hand corners of appendix tables B-1A and B-2A are displayed below, which represent cases 1 and 2, respectively. In table B-1A, the column for the Federal Government as a performer, as defined in the first row, is not subdivided because the Federal Government is the only source of funds for Federal intramural research. Industry performance, in contrast, is subdivided by the two main sources of industrial performance—the Federal Government and industry’s own funds.

In table B-1B, on the other hand, the Federal Government as a source defines a column in the first row, which is subdivided into several columns in the second row for the performers that receive those funds, such as the Federal Government itself and industry.

The third row of each table provides the column number for appendix table B-6, containing annual historical data from 1953–98 (where data for 1997 and 1998 are preliminary). Note, for instance, that, in appendix table B-1A, industrial performance that is funded by Federal support is designated as column “[4]” in appendix table B-6. In appendix table B-1B, Federal support that is directed to industry performers is also designated as column “[4]” because these two concepts are identically equal, and thus, they are represented by the same column in appendix table B-6. In fact, whenever one column of an appendix table contains the same column-number designation as that of another column in another table, both columns are identical in definition. This aspect of the column-number designations was deliberately designed in order to reduce uncertainty among researchers when deciding which columns of data to use.

Table 1. Illustration of the upper left-hand corner of appendix Table B-1A, on “National expenditures for R&D, by performing sector and sources of funding”

Performing Sector:	Total U.S.	Federal Govt.	Industry			Industry FFRDCs
Funding Sector:	Total U.S.	Federal Govt.	Total	Federal Govt. 2/	Industry 3/	Federal Govt. 2/
Data Column	[1]	[2]	[3]	[4]	[5]	[6]
Calendar Year 5/	[Millions of current dollars]					
1991 6/.....	160,521	15,249	114,675	24,095	90,580	2,277
1992.....	164,933	15,853	116,757	22,369	94,388	2,353
1993.....	165,188	16,532	115,435	20,844	94,591	1,965

Table 2. Illustration of the upper left-hand corner of appendix Table B-1B, on “Sources of national expenditures for R&D to performing sectors: 1991–98”

Funding Sector:	Total U.S.	Federal Government			
Performing Sector	Total U.S.	Total	Federal Govt.	Industry 2/	Industry FFRDCs 2/
Data Column	[1]	[37]	[2]	[4]	[6]
Calendar Year 5/	[Millions of current dollars]				
1991 7/.....	160,521	60,564	15,249	24,095	2,277
1992.....	164,933	60,694	15,853	22,369	2,353
1993.....	165,188	60,351	16,532	20,844	1,965

Appendix tables B-2 through B-4 are structured in exactly the same manner as appendix table B-1, but they refer to basic research, applied research, and development, respectively, rather than total R&D (the sum of those three components).

PLANS FOR ADDITIONAL IMPROVEMENTS

A separate methodological report to accompany *National Patterns of R&D Resources*. This and previous *National Patterns* reports contained broad descriptions of how data were compiled, how estimates were made, and how these methods have been revised over the years. As the amount of information in the report has grown, however, and as methods have become more complicated in many cases, it was determined that the provision of such information should not be subject to the space limitations that normally exist in the creation of the *National Patterns* report. Therefore, the Division of Science Resources staff is now producing a separate document, entitled *Methodology and Procedures Underlying the National Patterns Report*.

The new methodological report will differ from the kind of methodological information previously provided within earlier *National Patterns* reports in the following ways:

- The language and style of the report will be more technical, displaying, for example, the equations used in estimation, and the mathematical concepts underlying the use of those equations.
- The report will take advantage of the column-numbering system described above, by using column numbers, e.g., “[1]”, as shorthand for the concept that it measures, thereby facilitating the use of equations to describe methods.
- An effort will be made to document all methods of calculation underlying the *National Patterns* report. Such documentation will be provided at a level of detail great enough for colleagues to reproduce the exact results provided in the *National Patterns* report from the same raw data, if they so choose. The column notations described above, and other descriptive techniques, will allow such documentation to be written concisely and be read easily.
- Much more information will be provided on the nuances of the *National Patterns* effort, which will provide data users with a better understanding of the statistical strengths and weaknesses of the different R&D statistics that are generated.

DEFINITIONS FOR CLASSIFICATION AND MEASUREMENT

CLASSIFICATION OF SECTORS

The National Science Foundation (NSF) follows a four-sector division in reporting research and development (R&D) funds and personnel and maintaining time-series data on expenditures and employment. The sectors are: (1) industry, (2) the Federal Government, (3) universities and colleges, and (4) other nonprofit organizations. They are described in more detail below. Data also are collected for Federally Funded Research and Development Centers (FFRDCs), which are organizations exclusively or substantially financed by the Federal Government to meet a particular requirement or to provide major facilities for research and associated training purposes. Each center is administered either by an industrial firm, an individual university, a university consortium, or a nonprofit institution.

Federal Government. This sector consists of the agencies of the Federal Government.

Industry. This sector consists of both manufacturing and nonmanufacturing companies. Manufacturing companies are reported by major industry groupings. Nonmanufacturing companies include those in mining, construction, transportation, communications, and selected service industries such as R&D laboratories and computer and data processing services. Performance of FFRDCs administered by industrial firms generally is included in industry totals, although FFRDC breakouts are available and reported separately from R&D totals. Industry's funding of industry R&D includes all funds received from non-federal sources (e.g., from state and local governments).

Universities and Colleges. This sector consists of all institutions of higher education, both public and private. Expenditures of FFRDCs administered by universities and colleges are reported separately from totals for this sector. University funding of university R&D includes: restricted or general funds that the institutions themselves have been free to allocate for research. Funds from the Federal Government, industry, state governments, or other nonprofit institutions, which are supplied in the form of grants or contracts for R&D at a university, are credited to the appropriate source. For example, research contracts from industry are treated as university performance funded by industry. Funds given to the institution by industry for general educational purposes and used by the school—at its discretion—for research are treated as university performance financed with the university's own funds.

Other Nonprofit Institutions. This sector consists of institutions that fall into two general groups: (1) organizations that are primarily granting in nature—i.e., private philanthropic foundations and voluntary health agencies; and (2) public and private organizations involved in performing R&D, including FFRDCs administered by nonprofit organizations.

RESEARCH AND DEVELOPMENT CATEGORIES

Research and Development. In this report R&D consists of basic and applied research in the sciences (including medical sciences) and in engineering and activities in development, all defined below.

The Federal, university, and nonprofit sectors include data for the broad fields of physical sciences, environmental sciences, mathematical sciences, computer sciences, life sciences, psychology, social sciences, engineering, and an all-inclusive “other sciences” category. Industry coverage is limited to: (1) the physical sciences, including related engineering and (2) the biological sciences, including medicine but excluding psychology. Industry R&D specifically excludes research in the social sciences.

Basic Research. Within the Federal, university, and nonprofit sectors, basic research is defined as research directed toward increases in knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific application toward processes or products in mind. For the industry sector, basic research projects are defined as “original investigations for the advancement of scientific knowledge . . . which do not have specific commercial objectives, although they may be in fields of present or potential interest to the reporting company.”

Applied Research. Within the Federal, university, and nonprofit sectors, applied research is defined as research directed toward gaining “. . . knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.” The applied research definition for the industry sector is modified to include “. . . research projects which represent investigations directed to discovery of new scientific

knowledge and which have specific commercial objectives with respect to either products or processes.”

Development. The NSF survey definition of development is “. . . the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems or methods, including design and development of prototypes and processes.” It excludes quality control, routine product testing, and production.

DEFENSE-SPACE-CIVILIAN CLASSIFICATION

This report contains data on: (1) the estimated percentage distribution of total U.S. R&D performance by national objective (table B-9) and (2) the reported distribution of Federal R&D authority by budget function (table B-10). The performer-based U.S. shares differ from the Federal budget authority shares for several reasons. The U.S. shares are based on expenditures reported by performers, which often spends Federal R&D funds in a year other than the one in which the Federal Government provided authorization, obligations, or outlays. In addition, the two series are based on different concepts. For example, whereas in the U.S. series all of the National Aeronautics and Space Administration’s (NASA’s) R&D funds are considered to be expenditures for space R&D, the budget authority data are distributed according to the functional categories that constitute the Federal budget. Thus, NASA’s R&D budget authorizations are distributed between the space research and technology function and the transportation function.

“Defense R&D” consists of R&D spending by the Department of Defense (DoD) and defense-related atomic energy programs of the Department of Energy. All DoD activities are classified as defense, although some activities have secondary objectives (for example, space). “Space R&D” consists of R&D spending by NASA. All industry-funded R&D is classified as *civilian R&D*, including expenditures by aerospace and electronic industries.

CURRENT OPERATING COSTS

Funds used for R&D refer to current operating costs. These costs consist of both direct and indirect costs. They include not only salaries, but also fringe benefits, materials, supplies, and overhead. The R&D costs include

depreciation, insofar as this information is available to respondents. Capital expenditures are excluded by definition in the surveys of the industry and academic sectors. Under the accounting practices of some Federal agencies, obligations for capital items may be included.

For universities and colleges, R&D data are for separately budgeted expenditures only. Consequently, these data exclude that portion of salaries for research time or other research expenses financed by funds not specifically earmarked for R&D from state and local governments and other non-federal sources, including endowments.

INTRAMURAL FEDERAL PERFORMANCE OF R&D

Intramural R&D performance by Federal agencies refers to work carried on directly by agency personnel. Federal obligations reported under this category are for activities performed by the reporting agency itself or represent funds that the agency transfers to another Federal agency for performance of work, *as long as the ultimate performer is that agency or any other Federal agency*. If the ultimate performer is not a Federal agency, the survey questionnaire requests that the funds so transferred be reported by the transferring agency under the appropriate extramural performer category (universities and colleges, other nonprofit institutions, or industrial firms). Accurate identification of the ultimate performer is not always made.

Intramural activities cover not only the actual intramural R&D performance, but also the costs associated with the planning and administration of both intramural and extramural programs by Federal personnel. Intramural activities also include the costs of supplies and equipment, essentially of an “off-the-shelf” nature, that are procured for use in intramural R&D. For example, the purchase from an extramural source of an operational launch vehicle (i.e., one that has gone beyond the development or prototype stage) that is used for intramural performance of R&D is reported as a part of the cost of intramural R&D.

CONTROLLING FOR INFLATION AND FOREIGN CURRENCY

In the tables and figures of this report, the term “current dollars” refers to dollar amounts as they are measured and exchanged in the actual year, or years, in

question. In contrast, “constant dollars” refers to dollar amounts normalized for inflation. For example, if the same dollar amount is reported for two different years, and expressed as “current dollars,” then fewer actual goods and services could be purchased with that amount in the most recent year than in the earlier year, because of inflation. If the same amount is expressed as “constant dollars,” then it would be normalized for inflation in both years and, consequently, the same purchasing power would exist in each of the 2 years. Terms that are equal in meaning to “current” and “constant” dollars are, respectively, “nominal” and “real” dollars. These terms are also used to describe changes in dollar amounts over time. For instance, suppose a particular type of expenditure, when expressed in constant dollars, grew at a rate of 5 percent, per year, over a 10-year period. Such growth may be described as 5-percent growth “in real terms,” or equivalently, “real growth” of 5 percent, meaning the constant-dollar amounts grew at a 5-percent rate, while the current dollar amounts grew at a greater rate due to inflation.

In keeping with U.S. Government and international standards, R&D trend data usually are deflated to 1992 constant dollars using the Gross Domestic Product (GDP) implicit price deflator. (See table B-5.) Since GDP deflators are calculated on an economy-wide rather than R&D-specific basis, their use more accurately reflects an “opportunity cost” criterion, rather than a measure of cost changes in doing research. That is, the GDP deflator, when applied to R&D expenditure or funding data, reflects the value of R&D in terms of the amount of other goods and services that could have been purchased with the same amount of money. The constant dollar figures reported here thus should be interpreted as real resources foregone in engaging in R&D rather than in other activities such as consumption or physical investment.

Broad-based deflators—such as the GDP deflator—could also be useful in approximating changes in the costs of conducting R&D activities.¹ However, these deflators are less appropriate for calculating real R&D costs at a disaggregated level, e.g., in estimating the costs over time of conducting the level of R&D within a particular science or engineering subfield. In addition, even when an opportunity cost criterion is used, the usefulness of the deflator is constrained by the length of the time span examined—the longer the time span, the less meaningful the deflator. That is, over long spans of time, such as 20 years, dramatic changes in the makeup of goods and services create

ambiguities in the interpretation and measurement of quality change, which in turn, adversely affect the ultimate reliability of price deflators.²

As mentioned in the General Notes, all dollar amounts reported in the main text (as opposed to the tables or figures) are in current dollars. However, all growth rates reported are in “real terms,” i.e., they were calculated based on the corresponding real values (in constant 1992 dollars) of the reported current dollars.

Comparisons in this report of U.S. and international R&D expenditure data are based on reported R&D investments converted to U.S. dollars using “purchasing power parity” (PPP) exchange rates. PPP exchange rates are designed to reflect differences in the purchasing power of currencies, based on the quantity of currency needed in order to purchase equivalent quantities of actual goods and services in the countries in question. That is, PPP exchange rates reflect real purchasing power, in the same sense that “real dollars,” described above, control for inflation. The PPP exchange rates used are generally not equivalent to “market exchange rates,” i.e., how much one currency would cost if one were to buy it (with another currency) from a financial institution. This is because market exchange rates are often influenced by factors other than real purchasing power, namely the relative supply of, and demand for, different currencies in international financial markets. A PPP exchange rate would not be equivalent to an ideal “R&D exchange rate,” which does not exist at present, but would, in theory, account for international differences in R&D costs alone. Nevertheless, the PPP exchange rate is generally better at reflecting differences in R&D costs between countries than a market exchange rate.

PERFORMER REPORTING

There is no single survey of R&D activity in the United States. Rather, NSF sponsors a series of surveys to collect data on the financial and human resources devoted to R&D in the various sectors of the U.S. economy (defined above). Although these surveys are not designed

¹ See J.E. Jankowski, “Do We Need a Price Index for Industrial R&D?” *Research Policy* 22: 195-205.

² See M. Boskin, E. Dulberger, R. Gordon, Z. Griliches, and D. Jorgenson, “Consumer Prices, the Consumer Price Index, and the Cost of Living,” *Journal of Economic Perspectives*, Vol. 12, No. 1, Winter 1998, 3–26; W. Nordhaus, “Quality Change in Price Indexes,” *Journal of Economic Perspectives*, Vol. 12, No. 1, Winter 1998, 59–68; and S. Payson, *Quality Measurement in Economics: New Perspectives on the Evolution of Goods and Services* (Hants, England: Edward Elgar Publishing, Ltd., 1994).

specifically for this purpose, they provide the primary source material for estimating the national R&D totals. Respondents indicate the amounts they spend on R&D in their own sector and, generally, the sources of these funds. To the greatest extent possible, national totals are based on data as reported by performers because they are in the best position to: (1) indicate how much they spent in the actual conduct of R&D in a given year; (2) classify their work as basic, applied, etc.; and (3) identify the sector of the economy in which their financing originated. For those reasons, and because the consistent use of performer reporting reduces the possibility of double-counting and conforms to international standards (as outlined by the Organisation for Economic Co-operation and Development), R&D data are presented on a performer basis whenever possible.

Separate R&D performance totals are reported for: (1) the Federal Government, (2) industry, (3) industry-administered FFRDCs, (4) universities and colleges, (5) university-administered FFRDCs, (6) other nonprofit organizations, and (7) nonprofit-administered FFRDCs. R&D performed by state and local government agencies is not included in the national R&D totals. When state and local governments are listed by a survey respondent as the source of non-federal R&D funds, those amounts are included in the source totals of the sector reporting the R&D performance, except for university performance in which state funding is listed separately. For example, state-government support of industrial R&D is counted under industry's own support for industrial R&D.

FEDERAL GOVERNMENT

Federal Performance Expenditures. Federal agency R&D obligations for intramural performance are treated as the equivalent of R&D expenditures in the *National Patterns* series. As detailed in the *Federal Funds for Research and Development* series (*Federal Funds*), such intramural activities cover costs associated with the planning and administration by Federal personnel of intramural and extramural R&D programs as well as actual intramural R&D performance. (See NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*, Detailed Statistical Tables, NSF 99-332.) In general, the universe of Federal agencies with R&D programs has been surveyed annually since 1953 for their R&D performance, and since 1963 for the distribution of R&D by character of work. The most recent survey included R&D funding as reported by more than 300 reporting sites aggregated into 94 individual

respondents from 31 Federal agencies or their subdivisions.

Federal Agencies as a Source of R&D Funding. NSF collects data on federally financed R&D from both Federal funding agencies and performers of the work (Federal labs, industry, universities, and other nonprofit organizations). As reported by Federal agencies, *National Patterns* uses data on Federal R&D budget authority and outlays, in addition to Federal obligations. The use of each series is clearly noted in the text.

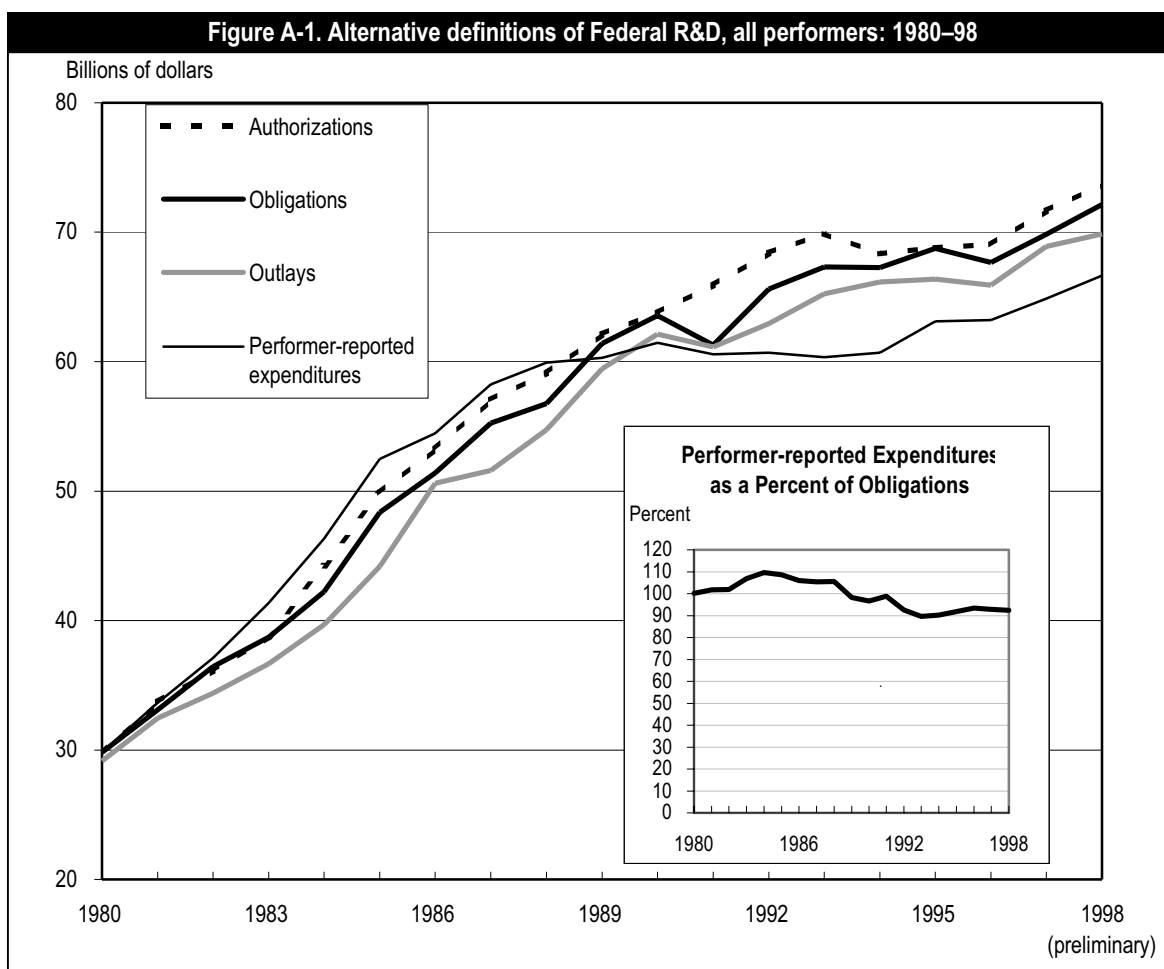
Budget authority is the primary source of legal authorization to enter into financial obligations that will result in outlays. Budget authority most commonly is granted in the form of appropriations laws enacted by Congress with the approval of the President.³

Obligations represent the amounts for orders placed, contracts awarded, services received, and similar transactions during a given period, regardless of when the funds were appropriated and when future payment of money is required.

Outlays represent the amounts for checks issued and cash payments made during a given period, regardless of when the funds were appropriated or obligated.

For the reasons above cited, national R&D expenditure totals are constructed primarily based on data reported by performers and include estimates of Federal R&D funding to these sectors. But before performer-reported survey data on Federal R&D expenditures are available from industry and academia, data collected from the Federal agency funders of R&D are used to project R&D performance. When survey data from the performers subsequently are tabulated, these statistics replace the projections that were based on the funders' expectations. Historically, the two survey systems tracked fairly closely. For example, in calendar-year 1980 performers reported using \$29.9 billion in Federal R&D funding, and Federal agencies reported total R&D funding in fiscal year 1980 between \$29.2 billion in outlays and \$29.8 billion in obligations. In recent years, the two series have diverged considerably: For calendar year 1998, performers report \$66.6 billion in Federal R&D support, by preliminary estimates, compared with \$72.1 billion reported by Federal agencies for fiscal year 1998 (table A-1 and figure A-1).

³ See *Federal R&D Funding by Budget Function: Fiscal Years 1997-98* (*Budget Function*), NSF 99-315.



SOURCE: National Science Foundation/Division of Science Resources Studies, table A-1.

The difference in the Federal R&D data totals appears to be concentrated in funding of industry (primarily aircraft and missile firms) by the Department of Defense (table A-2). Overall, industrial firms have reported significant declines in Federal R&D support since 1990 while Federal agencies reported level or slightly increased funding of industrial R&D. For fiscal year 1998, Federal agencies report \$31.7 billion in total R&D obligations provided to industrial performers (excluding industry-administered FFRDCs) compared with an estimated \$22.5 billion in Federal R&D funding reported by industrial performers. NSF is investigating causal factors for these divergent trends.

INDUSTRY

Sample Design Prior to 1992. In general, the industry sector has been surveyed annually since 1953 for its total R&D performance and since 1956 for the distribution by character of work. The U.S. Bureau of the Census conducts the survey for NSF. The target population of

the survey is companies, whether U.S. or foreign-owned, that perform R&D in the United States. Prior to the 1992 survey, a new sample was drawn and canvassed only every 5 or 6 years (for example, in 1976, 1981, and 1987). In the intervening years, a subset of the last sample—called a panel and including all companies reporting more than \$1 million in R&D—was surveyed. As a result, for the 1987 survey approximately 14,000 firms were selected for the sample. For the 1988 through 1991 studies, approximately 1,600 of these firms were resurveyed annually; the other firms did not receive another questionnaire, and their R&D data were estimated though not observed. Accordingly, data for the years in which a sample was not drawn did not include companies that were new entrants in the R&D field, and such data were generally biased in a downward direction. The Census Bureau, however, did estimate the annual changes in R&D data for companies that reported R&D in the sample year but were not included in the panel. As new samples were drawn, revisions to previous years' estimates were issued through a process called "wedging."

For example, a new sample was drawn for 1987, from which R&D data were collected for 1986 as well as 1987. Census used the data from the new sample to revise 1986 R&D performance estimates. The new 1986 data were also used by Census in combination with data from the last sample year, 1981, to revise estimates for the intervening years. NSF subsequently provided a second round of revisions to the 1982–85 R&D series. In both cases the revisions were done on an industry basis: an effort was made to apply the overall 1981–86 growth rates while preserving the relative year-to-year movements in each industry’s R&D. This approach resulted in major revisions of the 1982–87 industry R&D time series previously published in *National Patterns*, especially of the non-federally funded component of industry’s R&D performance. The revised totals, as well as the industry data reported in *National Patterns: 1990* (NSF 90-316), were presented in table B-3 of *National Patterns of R&D Resources: 1996* (NSF 96-333). (Some of these data have since been revised, but the revisions were unrelated to the drawing of a new sample.)⁴ Additional details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with the R&D expenditure data are contained in the 1990 edition (NSF 94-304) of the *Research and Development in Industry* series (*Industry R&D*).

Sample Design Revision in 1992. More recent surveys of industrial R&D performers have included revised R&D data based on relatively large industry samples. In contrast to data being based on probability samples selected approximately every 5 years, in 1992 NSF began to draw new samples annually, with the size of each sample increasing to approximately 24,000 firms. Industry classifications also were updated. The new sampling method now better reflects the widening population of R&D performers among firms in nonmanufacturing industries and small firms in all industries. As a result of these survey improvements, the revised 1991 industry R&D performance total (\$117 billion) was 14 percent higher than was previously reported (\$102.2 billion), and the national R&D total 10 percent higher. These revisions were first reported in *National Patterns: 1994* (NSF 95-304).

⁴Note that, although the Bureau of Census re-estimated 1982–86 R&D totals by funding source, it did not provide a character-of-work distribution for the revised data. After investigating several possible alternatives, NSF chose to allocate the revisions on the basis of average character-of-work distribution published in earlier annual *Industry R&D* reports. Allocations for the federally funded and nonfederally funded R&D revisions were applied separately.

Of the \$14.7 billion revision, \$13.7 billion resulted from the new sample and \$1.0 billion from normal data revisions for firms sampled in both surveys. Furthermore, \$11.4 billion of the \$13.7 billion increase stemming from the enlarged sample design was reported for nonmanufacturing industries, including \$2.0 billion of R&D in industries not previously included in the sample frame. Complete technical details on industry’s new survey methodology are contained in *Research and Development in Industry: 1992* (NSF 95-328).

As in previous sampling cycles, *National Patterns* includes revisions to the industry data for years intervening the 2 sample years (i.e., for 1988, 1989, and 1990). The industry and U.S. time series reported here include the wedged data reported for 1988–90 and the revised data for 1991–92. Table A-4 provides summary statistics for wedged data that appeared in *National Patterns of R&D Resources: 1994*, along with other data that were previously published.

For almost all of the aggregate statistics (for example, industry R&D by Federal and non-federal sources of funding), NSF believes that time series comparisons (for example, between 1981 and 1994 data) are still reasonable: Surveys undertaken in both years provided the best estimates of the Nation’s industrial R&D performance total by sampling those industries then believed to be conducting R&D. However, changes in the survey series between some data elements for consecutive years may be problematic. Not only do the 1987 and 1992 surveys’ sample size and frame differ considerably (see above), but \$9.2 billion (in constant 1992 dollars) of R&D performed by firms reporting in both surveys was shifted from one industry in 1987 to another in 1992—especially from manufacturing industries in 1987 to nonmanufacturing industries in 1992. Such classification shifts can be attributed to (1) product mix changes of individual firms that occurred some time during 1987–92, (2) changes in the 1987 SIC that were effected in the 1992 survey, and (3) a change in the methodology used by NSF/Census for classifying companies to specific two- and three-digit SIC industries. Given that NSF has been committed since 1992 to drawing new samples annually, the question of wedging, and the reporting biases it creates, is unlikely to recur.

Use of “Nonmanufacturing” as a Single Industrial Category. The enormous growth in, and increasing economic importance of, “nonmanufacturing industries” is common knowledge. In this vein, the listing of a “nonmanufacturing” sector (which would include all

services) in tables that compare it to specific manufacturing sectors like “primary metal products” in earlier *National Patterns* report was a somewhat archaic method of categorizing U.S. industries. Consequently, the current report provides several new categories all fitting under “nonmanufacturing,” although no historical data exist for these categories prior to 1995.

Nevertheless, analysts of R&D patterns might wish to consider that “where R&D is located,” in terms of the industrial R&D data presented in this report, is based on the classification of firms that perform the R&D, but may explain little about the forces underlying such R&D activities. In particular, many new forms of equipment and materials that result in technological innovation in services derive from R&D in manufacturing where such equipment and materials are first made. Health services is a case in point: continual innovation in medical services generally result from R&D in the manufacture of pharmaceuticals and new medical equipment. Because such R&D was carried out for the specific purpose of improving *services*, the attribution of such R&D to manufacturing rather than services is a matter of interpretation and precedence, not some absolute difference between the sectors in terms of their dependence on, or promotion of, scientific and engineering advances.⁵

Another issue is that services and manufacturing often differ in the nature of the R&D that they conduct. As a result, the relative quantity of R&D measured for services, in comparison to manufacturing, depends on how R&D is defined. For example, software development for particular computer entertainment packages, which would fall under services, would involve idea development that integrates computer science techniques with artistic creation. Whether such an activity would be classified as “R&D” would be a matter of interpretation and degree. In contrast, research on new hardware equipment would

be much less subject to interpretation, and would tend to be automatically classified as R&D.

Character-of-Work Revisions. As first noted in the *National Patterns of R&D Resources: 1990*, the procedures used by the Census Bureau for imputing character-of-work splits for industry’s R&D performance were changed for 1986 and later years; hence, these data are not directly comparable with data for 1985 and earlier years. A full description of the various imputation methodologies—and alternatives—is presented in the 1988 *Industry R&D* report (NSF 90-319). Briefly, for 1985 and earlier, for companies that did not report character-of-work splits, the Census Bureau imputed the splits based on either (1) the company’s percentage distribution reported in its most recent year of available data or (2) in the absence of any prior year breakdown for the company, the average character-of-work split for the industry to which the company was assigned. For years after 1985, the Census Bureau does not impute a company’s character-of-work distribution unless the company has reported a breakout within 2 years of the year being imputed. When distributions are not imputed, the Census Bureau assigns the company’s R&D to an “undistributed residual” category.

To provide character-of-work estimates for the entire population of firms performing R&D in the United States, each industry’s (as contrasted with each individual company’s) “undistributed residual” is allocated to basic research, applied research, and development categories using the average character-of-work splits reported for that industry. This approach resulted in relatively higher performance shares for basic and applied research than had been previously estimated and relatively lower estimates for development’s share of industry’s total R&D performance.

UNIVERSITIES AND COLLEGES

The academic sector, including all university-administered FFRDCs, has been surveyed for R&D performance annually, by fiscal year, since 1972. It was surveyed less frequently before 1972. For 1994–97, data were collected from a sample of the 681 institutions of higher education in the United States and outlying areas that (1) granted a graduate degree in science or engineering and/or (2) performed activities for which at least \$50,000 had been funded from separately budgeted R&D expenditures. Roughly 500 institutions were sampled annually, comprising all doctorate-granting

⁵For more detailed discussion on the interrelationship between R&D in manufacturing and advances in services, see, for example, B. Guile and J. Quinn, eds. *Technology in Services: Policies for Growth, Trade, and Employment* (Washington, DC: National Academy Press, 1988). For more general discussion of the causal relationship between R&D and industrial growth, see, for example, Adams, J.D. (1990) “Fundamental Stocks of Knowledge and Productivity Growth.” *Journal of Political Economy*. Vol. 98, No. 4: 673–702; Bernstein, J.I., and M.I. Nadiri. 1988. “Interindustry R&D Spillovers, Rates of Return, and Production in High-Tech Industries.” *American Economic Review, Papers and Proceedings* Vol. 78: 429–34; and Jaffe, A. 1986. “Technological Opportunity and Spillovers of R&D: Evidence from Firms’ Patents, Profits, and Market Value.” *American Economic Review* Vol. 76: 984–1001.

institutions, all historically black colleges and universities with any R&D expenditures, and a random sample of all other institutions. For fiscal year 1993, data were collected from the full population of 681 institutions that met the criteria listed above.

Character-of-Work Revisions. With the exception of 1978, data on the basic research performance of universities and colleges and of university-administered FFRDCs have been collected annually since 1972. Since 1979, however, only the combined total for applied research and development performance has been collected. Furthermore, data on the character of work from individual non-federal sources of funds (i.e., industry, institutional funds, state and local governments, and other sources) are not surveyed. For the years 1978 to the present, the distribution of applied research and development from Federal sources is based largely on data from *Federal Funds*. The method of estimation for these levels is provided in the forthcoming methodology report.

Revised estimates for Federal funding of applied research and development to universities and colleges and to university-administered FFRDCs were first included in the *National Patterns of R&D Resources: 1992*. University performers report the amount of R&D and basic research that they undertake using Federal funds. The residual is their combined applied research and development performance. The distribution between applied research and development is approximated from the percentage shares of Federal obligation data to the academic sector as reported by Federal agencies in *Federal Funds*. Although the estimating procedures used previously had been loosely based on the data provided by the Federal funding agencies, the approach adopted here formally links the performer- and source-reported survey data. Applied research and development expenditures for universities and colleges were revised for the period 1978–present; for university-administered FFRDCs, revisions were made back to 1975. The general result is that the applied research share is slightly lower

and the development share somewhat higher than previously reported.

Subcontracting. Only for the academic sector does R&D performance include research funds subcontracted to outside organizations. (For performance reported by respondents in the other surveyed sectors, R&D subcontracted to other organizations is excluded.) Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with the R&D expenditure data are reported in the fiscal year 1996 report, *Academic Research and Development Expenditures (Academic R&D)*, NSF 98-304. There is preliminary evidence from NSF surveys that approximately 3 percent of total academic R&D funds are passed through the university to other recipients.

OTHER NONPROFIT INSTITUTIONS

It has not been possible to maintain the same survey frequency for other nonprofit institutions; the last complete survey was conducted in 1973. Since then, small and informal surveys of this sector have been undertaken periodically.

For the years 1984 to the present, estimates for federally funded total R&D and character-of-work performance by nonprofit institutions—including associated FFRDCs—are derived from Federal obligation data reported in *Federal Funds*. Industry as a source of R&D funds to this sector is approximated using the average of the annual percentage change in (1) industry’s funding of industry-performed R&D (from *Industry R&D*) and (2) industry funding of university-performed R&D (from *Academic R&D*). Nonprofit funding as a source of R&D funds to this sector is approximated based on the annual percentage change in nonprofit funding of university-performed R&D (from *Academic R&D*). The character-of-work splits from the non-federal funding sources that were surveyed in 1983 are carried forward to the present.

DATA ANALYSIS

PRELIMINARY DATA AND PROJECTION PROCEDURES FOR 1997 AND 1998

To the greatest extent possible, this report incorporates data for 1997 and 1998 R&D programs that are presented in the administration's 1999 budget proposal. For example, the 1999 budget contains data on total R&D outlays and budget authority by agency and by character of work. However, the budget does *not* contain reliable estimates on the amount of Federal R&D funds received by each of the R&D-performing economic sectors; it only shows the federally funded totals and funds received by universities and colleges. The detailed sector-specific information is obtained from an NSF survey of Federal agencies' R&D obligations, which is collected after the President's proposed budget has been published. For this reason, some of the 1997 and 1998 Federal R&D data reported here are based on the administration's 1998 budget proposal.

Preliminary R&D performance totals in *National Patterns* are calculated for each sector, by character of work, and by source of funds from surveys and time-series extrapolation techniques, as follows.

Federal Government. Projections for 1997 and 1998 are based on changes in intramural R&D obligations reported in *Federal Funds*. The amounts reported for 1997 are preliminary and reflect congressional appropriations, apportionment, and reprogramming decisions as of the third quarter of FY 1998. Data for 1998 are projections that reflect the changes in intramural R&D represented in administration 1999 budget proposals.

Industry. Preliminary data for company-funded 1997 and 1998 performance are based on industry responses to the 1997 *Industry R&D Survey*, as of June 1998. This sample of preliminary responses accounted for approximately 50 percent of the R&D performed by industrial firms in 1996.

Universities and Colleges. Preliminary data for 1997 are based on university responses to the FY 1997 *Academic R&D Survey*, as of June 1998. These respondents accounted for approximately 90 percent of the R&D performed by universities and colleges in FY 1996.

Other Nonprofit Institutions. Preliminary tabulations for 1997 and 1998 are based on (1) Federal obligations reported in *Federal Funds* (NSF 98-332) and (2) time series modeled extrapolations of recent trends in R&D performance and funding within the industry and university sectors. (The method of estimation for these levels is provided in the forthcoming methodology report.)

USE OF TIME-SERIES DATA

Data presented in trend tables are assembled from the most recently completed survey cycles. Data for prior years are reviewed for consistency with current year's responses and—when necessary—revised in consultation with survey respondents. In addition, changes in sample design or imputation methodologies can result in revisions to previously published data. For trend comparisons, the historical data contained in this report should be used rather than the data published in previous *National Patterns* volumes.

GEOGRAPHIC DISTRIBUTION

This report contains information on the state distribution of R&D performance for 1995 (tables B-7 and B-8). These data cover R&D performance by industry, academia, Federal agencies, and the federally funded R&D activities of nonprofit institutions. These state-distributed data are meant to be indicative of general distribution patterns; they are not necessarily precise.

State-distributed data for the industry sector are collected for odd-numbered years. The latest available detailed data are for 1995 and are from *Research and Development in Industry: 1995–96* (NSF 99-312). The data include R&D performance by industry-administered FFRDCs.

State-distributed data for Federal laboratories are intramural R&D obligations in FY 1995. These data are available from the 10 major R&D-supporting agencies (*Federal Funds*).

State-distributed data for the academic sector are collected only for doctorate-granting institutions and

university-administered FFRDCs (*Academic R&D*). R&D performance by an FFRDC is assigned to the state in which the FFRDC is located, which is not necessarily the state in which the administering institution is located.

State-distributed data for other nonprofit institutions are Federal R&D obligations to this sector in FY 1995 as

reported by the 10 major R&D-supporting government agencies (*Federal Funds*). These agencies provided approximately 98 percent of total Federal R&D obligations in 1995. Data on R&D performance by this sector using non-federal sources of funds are not collected.

HUMAN RESOURCES

The 1994 *National Patterns* was the first to include revised data on scientists and engineers (S&Es) engaged in R&D activities. This national series consists of separate survey estimates of R&D S&Es employed in industry and in the Federal Government and doctorate-holding R&D S&Es employed in educational institutions and in nonprofit organizations. The industry series are for S&Es employed on a full-time-equivalent basis; totals for the other sectors reflect the primary work activity of S&Es.

A variety of surveys and estimation techniques are used to gather information on the numbers and characteristics of persons engaged in science and engineering activities in all sectors of the economy. In general, two types of surveys report worker inputs for R&D: surveys directed at individuals and surveys directed at employers.

SURVEYS OF INDIVIDUALS

These surveys (in this report, of scientists and engineers holding doctorate degrees) result in data on the primary work activities and demographic and economic characteristics of the respondents. In the survey of doctoral scientists and engineers, respondents are asked to report their primary work activity—i.e., the activity on which they spend the largest proportion of their time, but that is not necessarily a full-time activity. This survey is conducted only in odd-numbered years. The latest tabulated data are available for 1995 and are summarized in appendix table B-28. Details on survey methods, coverage, concepts, definitions, and reliability of the estimates associated with these S&E data are in *Characteristics of Doctoral Scientists and Engineers in the United States: 1995* (NSF 97-319).

SURVEYS OF EMPLOYERS

These surveys generally are focused on the amount of time—in terms of person-years—devoted to the performance and management of R&D. In this report, data on the number of S&Es—not just those holding doctoral degrees—employed by industry on an full-time-equivalent (FTE) basis in R&D are summarized in appendix table B-27. For example, if each of two scientists/engineers spends 50 percent of the workday on R&D, the equivalent is one FTE R&D job.

Previously, the *National Patterns* provided national estimates of FTE R&D scientists and engineers. At one point, SRS had survey data for FTE estimates in all sectors of the economy. Currently, SRS collects such data only for the industrial sector. The last FTE R&D manpower survey of the academic sector was for 1985, and the last manpower survey of the nonprofit sector was for 1973, although a small telephone survey was conducted for 1983. The loss of such survey data had necessitated increased reliance on analytically derived figures (including the use of regression equations) that were based largely on estimating assumptions that could not be empirically tested for their continued validity. Consequently, those preliminary series are replaced here with survey counts of the number of doctorate-holding S&Es who self-report their primary work activity as R&D or R&D management. How well these head counts might approximate an FTE estimate is unknown. On the one hand, these head counts may provide an overestimate of FTE activity since many of the surveyed S&Es are not engaged in R&D full-time even though it is their primary work activity. On the other hand, this approach may underestimate FTE R&D personnel since it does not account for S&Es engaged in R&D who do not hold a doctorate degree. Sources for the revised estimates and comparison with the 1985 and 1989 figures published in *National Patterns: 1992*, are described and summarized in table A-7. For the total United States, the revised figures for 1989 (924,200) are 3 percent lower than previously reported (949,300).

Industry. Industry is the only sector for which FTE R&D S&E survey estimates are available. Firms report (*Industry R&D*) FTE employment levels for January of each year, and a simple 2-year moving average is used for the national R&D S&E series. For example, the total reported for 1989 (733,000) is the average of the level reported by firms for January 1989 and January 1990. Except for minor data revisions resulting from the inclusion of wedged statistics, the industry totals reported here do not differ from those reported previously. As detailed above for the industry expenditure data, improvements in the sample design for 1992 and later years resulted in data that now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries.

Federal Government. For the Federal sector, survey data on civilian scientists and engineers are collected

annually (*Federal Scientists and Engineers: 1989–93*, NSF 95-336). The estimates are compiled from the U.S. Office of Personnel Management’s (OPM’s) Central Personnel Data File on all white collar civilian jobs and are reported in terms of primary work activities. Scientists or engineers are included in the *National Patterns* totals if their primary work activity is research or development. These head counts exclude (1) military personnel (but include civilian S&Es employed in defense agencies) and (2) Federal employees classified in a management occupational code, even if they manage an R&D program. The earliest year for which these OPM statistics have been compiled is 1985. Data for 1985–89 published in the previous *National Patterns* included estimates for R&D managers, which are no longer included in the Federal totals. For years prior to 1985, the figures were based on NSF surveys since discontinued.

Universities and Colleges. For the academic sector two series are reported: doctoral scientists and engineers and graduate students doing research. The head counts for research students are from the *Survey of Graduate Students and Postdoctorates in Science and Engineering* and are for full-time science and engineering graduate students in all institutions whose major financial support is research assistantships. In this revised series FTE estimates are derived assuming a 50-percent workload (or working half-time on R&D), whereas previously a 47-percent workload assumption was used.

Academic institutions were previously surveyed for estimates of FTE R&D S&Es; however, 1985 is the most recent year for which this survey was conducted. Since then the academic estimates published in *National Patterns* were usually derived from a regression of the 1975–85 academic FTE survey data on (1) academic R&D expenditures and (2) the number of academic doctoral S&Es who reported R&D as their primary work activity. The revised series directly utilizes reported employment levels from the *Survey of Doctorate Recipients (SDR)*. The academic R&D employment totals are of doctoral scientists and engineers employed

in all educational institutions who self-report their primary work activity as “research,” “development or design,” or the “management or administration of R&D.” No adjustments are made to derive full-time equivalents. For 1989, the revised primary work activity total, (83,500), is approximately 11 percent less than the FTE figure, (93,700), last published in *National Patterns*. Since the doctoral data are collected only biennially, the revised national FTE series also are reported biennially.

NSF introduced a number of improvements into the 1991 SDR (for example, changes in the age-based cohorts collected and in the definition of doctoral scientists and engineers) that may affect comparability with SDR data published for prior survey years. The academic S&E total for those reporting R&D as their primary work activity for 1989 is 83,500 and the total for 1991 is 74,600. Whether changes in the survey design or in actual employment patterns caused the academic R&D S&E decline is unknown. Analysts should consult the report, *Characteristics of Doctoral Scientists and Engineers in the United States: 1991* (NSF 94-307) for more information on these methodological changes.

Other Nonprofit Institutions. The last survey of the nonprofit sector was for 1973. Since then the nonprofit estimates published in *National Patterns* generally were based on survey data from the early seventies and trends in the ratio of national R&D expenditures to FTE R&D S&Es. In the revised series, nonprofit R&D employment levels are taken from the *Survey of Doctorate Recipients*. The figures are for doctoral scientists and engineers employed in nonprofit organizations who self-report their primary work activity as “research,” “development or design,” or the “management or administration of R&D.” No adjustments are made to derive full-time equivalents. For 1989, the revised primary work activity total (9,200) is approximately 75 percent less than the FTE figure (34,500) last published in *National Patterns*. The effect on the Nation’s total FTE estimate is approximately a 2.7-percent downward revision.

LIST OF SUPPORTING DATA SOURCES ON R&D EXPENDITURES

National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*, NSF 98-332 (Arlington, VA, 1998). Detailed statistical tables cover R&D (and R&D plant) funding levels for FYs 1996–98 as reported by all Federal agencies with R&D programs. Includes data by agency, performer, character of work, geographic distribution, and field of science and engineering.

National Science Foundation, *Federal R&D Funding by Budget Function: Fiscal Years 1997–99*, NSF 99-315 (Arlington, VA, 1999). Provides information on Federal R&D budget authority by Federal budget function as proposed in the administration's 1999 budget.

Office of Management and Budget, *The Budget of the United States Government, Fiscal Year 1999* (Washington, DC: GPO, 1998). Provides quantitative and qualitative information on R&D funding as proposed in the administration's 1999 budget.

National Science Foundation, *Research and Development in Industry: 1995–96*, NSF 99-312 (Arlington, VA, 1999). Detailed statistical tables cover industrial R&D performance as reported in a sample survey of companies. Data include distribution by source of funds, industry classification, character of work, product field, geographic location, company size, and other tabulations.

National Science Foundation, *Academic Research and Development Expenditures: Fiscal Year 1996*, NSF 98-304 (Arlington, VA, 1998). Detailed statistical tables cover academic R&D performance as reported in a survey of U.S. universities and university-administered FFRDCs. Data include distribution by source of funds, performing institution, character of work, field of science, and geographic location.

TABLES CORRESPONDING TO TECHNICAL NOTES

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**Table A-1. Difference in agency-reported and performer-reported Federal R&D,
all performers: 1980–99**

Year	Reported by Federal agencies (by fiscal year)			Performer-reported
	Authorizations	Obligations	Outlays	expenditures (calendar year)
	[Millions of dollars]			
1980.....	29,739	29,830	29,154	29,857
1981.....	33,735	33,104	32,459	33,666
1982.....	36,115	36,433	34,391	37,113
1983.....	38,768	38,712	36,659	41,362
1984.....	44,214	42,225	39,691	46,319
1985.....	49,887	48,360	44,171	52,493
1986.....	53,249	51,412	50,609	54,475
1987.....	57,069	55,254	51,612	58,254
1988.....	59,106	56,769	54,739	59,930
1989.....	62,115	61,406	59,450	60,301
1990.....	63,781	63,559	62,135	61,457
1991.....	65,898	61,295	61,130	60,564
1992.....	68,398	65,593	62,934	60,694
1993.....	69,884	67,314	65,241	60,351
1994.....	68,331	67,257	66,151	60,700
1995.....	68,791	68,736	66,371	63,102
1996.....	69,049	67,663	65,910	63,215
1997 (preliminary)...	71,653	69,830	68,897	64,865
1998 (preliminary)...	73,639	72,114	69,849	66,636
1999 (preliminary)...	75,229	73,333	71,112	NA

SOURCES: National Science Foundation/Division of Science Resources Studies. Federal Funds Survey, *Detailed Historical Tables, Fiscal Years 1951–98*; *Federal Funds for Research and Development: Fiscal Years 1997, 1998, and 1999*; and Table B-6.

**Table A-2. Difference in agency-reported and performer-reported Federal R&D:
industrial performers by agency source, 1980–96**

Year	Industry Survey (calendar year) 1/			Federal Survey—obligations (fiscal year) 1/			Difference in Report Totals		
	Total	Department of Defense	Other agencies	Total	Department of Defense	Other agencies	Total	Department of Defense	Other agencies
	[Millions of dollars]								
1980.....	14,029			14,377			(348)		
1981.....	16,382	10,540	5,842	16,282	10,931	5,351	100	(391)	491
1982.....	18,545			18,699			(154)		
1983.....	20,680	14,571	6,109	18,521	14,671	3,850	2,159	(100)	2,259
1984.....	23,396			20,219			3,177		
1985.....	27,196	20,948	6,248	23,496	19,069	4,427	3,700	1,879	1,821
1986.....	27,891			25,898			1,993		
1987.....	30,752	22,252	8,500	28,628	24,258	4,370	2,124	(2,006)	4,130
1988.....	30,343			28,631			1,712		
1989.....	28,554	NA	NA	30,604	25,043	5,561	(2,050)	NA	NA
1990.....	28,125			31,697			(3,572)		
1991.....	26,372	NA	NA	28,589	21,350	7,239	(2,217)	NA	NA
1992.....	24,722			31,862			(7,140)		
1993.....	22,809	15,044	7,765	31,670	23,856	7,814	(8,861)	(8,812)	(49)
1994.....	22,463			31,748			(9,285)		
1995.....	23,451	13,876	9,575	31,674	22,645	9,029	(8,223)	(8,769)	546
1996.....	23,653			31,498			(7,845)		

1/ Includes industry-administered federally funded research and development centers (FFRDCs).

KEY: NA = not available

NOTES: Data from the Industry Survey are R&D expenditures as reported by performing firms. Data from the Federal Survey are R&D obligations to industry as reported by Federal agencies. The last three columns report the difference between the two data series.

SOURCES: National Science Foundation/Division of Science Resources Studies. Federal Funds Survey, *Detailed Historical Tables, Fiscal Years 1951–98*; *Federal Funds for Research and Development: Fiscal Years 1997, 1998, and 1999*; and *Research and Development in Industry: 1995–96*.

Table A-3. Revisions in industry R&D performance totals: 1982–87

Year	Total R&D			Non-federal funds			Federal funds		
	1989 National Patterns	Revision	1990 National Patterns	1989 National Patterns	Revision	1990 National Patterns	1989 National Patterns	Revision	1990 National Patterns
	[Millions of dollars]								
1982.....	57,995	655	58,650	39,512	593	40,105	18,483	62	18,545
1983.....	63,403	1,865	65,268	42,861	1,727	44,588	20,542	138	20,680
1984.....	71,470	3,330	74,800	48,308	3,096	51,404	23,162	234	23,396
1985.....	78,269	5,970	84,239	51,439	5,604	57,043	26,830	366	27,196
1986.....	80,631	7,548	88,179	52,848	7,084	59,932	27,783	464	28,247
1987.....	85,500	8,617	94,117	55,500	7,306	62,806	30,000	1,311	31,311

NOTE: These methodological revisions were first reported in *National Patterns of R&D Resources: 1990*. These data may have been subsequently revised since the methodological revisions were first introduced. Any such subsequent revisions are not reflected in this table.

SOURCE: National Science Foundation/Division of Science Resources Studies, *National Patterns of R&D Resources: 1990*.

Table A-4. Revisions in industry R&D performance, and their impact on other variables: 1987–91

Year	Total industry R&D		Non-federal funds to industry		Federal funds to industry		National R&D funds		R&D/GDP		Federal funds as percent of total		Defense R&D as percent of total	
	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns	Previous estimates	1994 National Patterns
	[Millions of dollars]													
1987.....	92,155	92,155	61,403	61,403	30,752	30,752	125,376	125,376	2.8	2.8	46.2	46.2	31.3	31.3
1988.....	97,889	97,015	65,772	66,672	32,117	30,343	133,764	132,890	2.73	2.71	45.8	44.8	30.2	29.5
1989.....	101,854	102,055	70,562	73,501	31,292	28,554	140,824	141,025	2.68	2.68	44.5	42.5	28.4	27.1
1990.....	104,606	109,727	73,980	81,602	30,626	28,125	146,424	151,545	2.64	2.73	43.7	40.6	27.0	25.1
1991.....	102,246	116,952	25,308	90,580	25,308	26,372	145,383	160,096	2.54	2.80	40.7	37.6	24.3	22.3

NOTE: These methodological revisions were first reported in *National Patterns of R&D Resources: 1994*. These data may have been subsequently revised since the methodological revisions were first introduced. Any such subsequent revisions are not reflected in this table.

SOURCE: National Science Foundation/Division of Science Resources Studies, *National Patterns of R&D Resources: 1994*.

Table A-5. Distribution of industry R&D performance, by character of work: 1985–96

Year	Non-federal funds					Federal funds				
	Census imputation					Census imputation				
	Total R&D	Basic research	Applied research	Development	Undistributed residual	Total R&D	Basic research	Applied research	Development	Undistributed residual
	[Millions of dollars]									
1985.....	57,043	2,140	11,640	37,659	5,604	27,196	482	5,275	21,073	366
1986.....	59,932	2,162	9,914	29,081	18,775	27,891	370	3,444	17,074	7,003
1987.....	61,403	2,332	10,558	30,819	17,694	30,752	534	3,510	18,770	7,938
1988.....	66,672	2,315	11,507	33,061	19,789	30,343	731	3,255	18,829	7,528
1989.....	73,501	2,741	13,328	37,599	19,833	28,554	1,050	3,567	16,224	7,713
1990.....	81,602	3,519	14,867	38,610	24,606	28,125	981	3,684	17,495	5,965
1991.....	90,580	5,270	17,511	51,568	16,231	26,372	1,220	4,808	14,749	5,595
1992.....	94,388	5,076	18,223	58,907	12,182	24,722	910	4,325	16,780	2,707
1993.....	94,591	5,345	17,345	60,991	10,910	22,809	952	4,698	16,561	597
1994.....	97,131	5,453	16,894	63,719	11,065	22,463	921	4,040	16,217	1,285
1995.....	108,652	4,581	19,744	68,938	15,388	23,451	511	2,725	14,679	5,536
1996.....	121,015	5,897	21,373	77,434	16,311	23,653	1,114	3,013	14,420	5,106
Reported in 1998 National Patterns						Reported in 1998 National Patterns				
1985.....	57,043	2,373	12,908	41,762	0	27,196	489	5,347	21,360	0
1986.....	59,932	3,496	15,082	41,354	0	27,891	551	4,678	22,662	0
1987.....	61,403	3,583	15,153	42,667	0	30,752	740	4,660	25,352	0
1988.....	66,672	3,507	16,531	46,634	0	30,343	993	4,217	25,133	0
1989.....	73,501	3,832	17,993	51,676	0	28,554	1,384	4,698	22,472	0
1990.....	81,602	3,760	18,432	59,410	0	28,125	1,368	6,353	20,404	0
1991.....	90,580	6,125	21,425	63,030	0	26,372	1,712	6,021	18,639	0
1992.....	94,388	5,816	21,184	67,388	0	24,722	1,186	4,983	18,554	0
1993.....	94,591	5,961	19,956	68,674	0	22,809	958	4,730	17,122	0
1994.....	97,131	6,078	19,372	71,681	0	22,463	939	4,119	17,405	0
1995.....	108,652	5,379	23,755	79,518	0	23,451	720	3,699	19,033	0
1996.....	121,015	6,848	25,370	88,797	0	23,653	1,358	3,871	18,424	0

NOTES: Because of rounding, detail may not sum to totals. These methodological factors were first reported for the years 1985–87 in *National Patterns of R&D Resources: 1990*. Industrial performance here includes industry-administered federally funded research and development centers (FFRDCs).

SOURCE: National Science Foundation/Division of Science Resources Studies.

Table A-6. Revisions in university & college performance by Federal source of funds: 1974–90

Year	Universities and colleges				University-administered FFRDCs			
	1990 National Patterns		1992 National Patterns		1990 National Patterns		1992 National Patterns	
	Applied research	Development	Applied research	Development	Applied research	Development	Applied research	Development
	[Millions of dollars]							
1974.....	438	71	438	71	178	297	178	297
1975.....	516	78	516	78	213	335	203	345
1976.....	584	87	584	87	264	371	235	400
1977.....	607	112	607	112	371	413	290	494
1978.....	673	122	644	194	431	419	319	531
1979.....	873	150	709	314	468	452	342	578
1980.....	1,043	200	880	361	503	619	424	698
1981.....	1,087	225	943	364	529	696	424	801
1982.....	1,142	225	957	406	606	556	430	732
1983.....	1,217	225	1,052	387	726	539	456	809
1984.....	1,401	200	1,187	410	804	671	541	934
1985.....	1,515	200	1,261	458	835	939	591	1,183
1986.....	1,611	225	1,329	512	774	1,262	565	1,471
1987.....	1,706	250	1,452	512	693	1,501	538	1,656
1988.....	2,229	275	1,857	694	697	1,612	534	1,775
1989.....	2,300	300	2,118	724	720	1,680	605	1,795
1990.....	2,325	325	2,219	857	740	1,760	630	1,799

KEY: FFRDCs = federally funded research and development centers

NOTE: These methodological revisions were first reported in *National Patterns of R&D Resources: 1992*. These data may have been subsequently revised since the methodological revisions were first introduced. Any such subsequent revisions are not reflected in this table.

SOURCE: National Science Foundation/Division of Science Resources Studies, *National Patterns of R&D Resources: 1992*.

Table A-7. Revisions in number of R&D scientists and engineers: 1985 and 1989

Sector and primary work activity	1985		1989	
	Previous data	Revised data	Previous data	Revised data
	[Thousands]			
Total United States R&D scientists and engineers.....	841.6	801.9	949.3	924.2
Industry: Number of full-time equivalent R&D S&Es.....	646.8	646.8	726.0	733.1
Federal Government: Number of S&Es, Total.....	55.0	52.1	60.0	58.8
Research.....	22.3	22.3	22.9	24.6
Development.....	29.7	29.7	33.2	34.2
R&D management.....	2.9	--	3.9	--
Educational institutions: Full-time equivalent R&D S&Es, total.....	81.1	--	93.7	--
Doctoral S&Es, total.....	--	64.7	--	83.5
Basic research.....	--	43.6	--	52.7
Applied research.....	--	15.7	--	26.0
Development/design.....	--	1.4	--	0.9
Management/administration of R&D.....	--	4.0	--	3.9
FTE S&E graduate students with research assistantships.....	27.2	30.5	35.1	39.5
Nonprofit organizations: Full-time equivalent R&D S&Es, total.....	31.5	--	34.5	--
Doctoral S&Es, total.....	--	7.8	--	9.2
Basic research.....	--	3.4	--	3.8
Applied research.....	--	2.2	--	3.2
Development/design.....	--	0.5	--	0.5
Management/administration of R&D.....	--	1.7	--	1.7
R&D S&Es per 10,000 labor force.....	71.8	68.4	75.6	73.0

KEY: FTE = full-time equivalent

NOTES: These methodological revisions were first reported in *National Patterns of R&D Resources: 1994*. These data may have been subsequently revised since the methodological revisions were first introduced. Any such subsequent revisions are not reflected in this table.

SOURCES: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development; Survey of Doctorate Recipients; Survey of Graduate Students and Postdoctorates in Science and Engineering; U.S. Office of Personnel Management; and Bureau of Labor Statistics, Employment and Earnings (annual)

APPENDIX B

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Table B-1A. National expenditures for R&D, by performing sector and sources of funding: 1991–98 1/

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Performing sector:	Total U.S.	Federal Govt.	Industry			Industry FFRDCs	Universities & colleges						U&C FFRDCs	Other nonprofit institutions				Nonprofit FFRDCs
Funding sector:	Total U.S.	Federal Govt.	Total	Federal Govt. 2/	Industry 3/	Federal Govt. 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 4/	Total	Federal Govt. 2/	Industry	Nonprofits	Federal Govt. 2/
Data column	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]	[16]	[17]	[18]
Calendar year 5/	[Millions of current dollars]																	
1991 6/.....	160,521	15,249	114,675	24,095	90,580	2,277	17,892	10,448	1,477	1,224	3,411	1,333	5,120	4,611	2,679	680	1,252	696
1992.....	164,933	15,853	116,757	22,369	94,388	2,353	19,100	11,307	1,507	1,300	3,558	1,428	5,259	4,864	2,806	716	1,342	748
1993.....	165,188	16,532	115,435	20,844	94,591	1,965	20,224	12,133	1,554	1,374	3,654	1,509	5,289	4,995	2,839	737	1,418	749
1994.....	168,586	16,432	117,393	20,261	97,131	2,202	21,340	12,840	1,576	1,431	3,904	1,589	5,305	5,155	2,900	762	1,493	759
1995.....	183,045	17,133	129,830	21,178	108,652	2,273	22,406	13,470	1,692	1,506	4,112	1,626	5,388	5,203	2,848	827	1,528	812
1996.....	196,011	16,574	142,370	21,356	121,015	2,297	23,280	13,962	1,730	1,604	4,322	1,663	5,362	5,359	2,896	901	1,562	769
1997 prelim.....	205,561	16,585	150,337	22,061	128,276	2,373	24,438	14,582	1,764	1,717	4,667	1,708	5,459	5,561	2,996	960	1,605	810
1998 prelim.....	220,617	16,936	163,328	22,481	140,847	2,418	25,672	15,247	1,845	1,829	4,974	1,778	5,529	5,928	3,219	1,038	1,671	807
Data column	[19]	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]	[30]	[31]	[32]	[33]	[34]	[35]	[36]
Calendar year 5/	[Millions of constant 1992 dollars]																	
1991 6/.....	164,942	15,669	117,833	24,759	93,074	2,340	18,385	10,735	1,518	1,257	3,505	1,369	5,261	4,738	2,753	699	1,287	715
1992.....	164,933	15,853	116,757	22,369	94,388	2,353	19,100	11,307	1,507	1,300	3,558	1,428	5,259	4,864	2,806	716	1,342	748
1993.....	160,940	16,107	112,466	20,308	92,158	1,914	19,703	11,820	1,514	1,339	3,560	1,470	5,153	4,866	2,766	718	1,382	730
1994.....	160,421	15,637	111,707	19,280	92,426	2,095	20,306	12,218	1,500	1,362	3,715	1,512	5,048	4,905	2,760	725	1,421	723
1995.....	169,864	15,900	120,481	19,653	100,828	2,109	20,792	12,500	1,570	1,398	3,816	1,509	5,000	4,829	2,643	768	1,418	754
1996.....	177,852	15,038	129,181	19,378	109,804	2,084	21,124	12,669	1,570	1,456	3,921	1,508	4,865	4,863	2,627	818	1,418	698
1997 prelim.....	182,883	14,755	133,751	19,627	114,124	2,111	21,742	12,974	1,569	1,527	4,152	1,520	4,856	4,948	2,665	854	1,428	721
1998 prelim.....	192,611	14,786	142,594	19,627	122,967	2,111	22,413	13,311	1,611	1,596	4,342	1,552	4,827	5,175	2,810	906	1,459	705

1/ The next updates of these data, covering the years 1953–99, will be provided in NSF, *National Patterns of R&D Resources: 1999 Data Update*, which is expected in the fall of 1999.

2/ For 1953–54, expenditures of industry FFRDCs were not separated out from total Federal support to the industrial sector. Thus, the figure for Federal support to industry includes support to FFRDCs for those two years. The same is true for expenditures of nonprofit FFRDCs, which are included in Federal support for nonprofit institutions in 1953–54.

3/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

4/ Includes all R&D expenditures of FFRDCs administered by academic institutions. In 1996, 99 percent of total funds used were from Federal sources.

5/ Expenditure levels for academic and Federal Government performers are also in reference to calendar years, which represents a change from previous reporting in *National Patterns of R&D Resources*. These levels are approximations based on fiscal-year data. For academic expenditures, and Federal Government expenditures starting in 1977, the calendar-year approximation is equal to 75 percent of the amount reported in the same fiscal year plus 25 percent of the amount reported in the subsequent fiscal year. For Federal Government expenditures prior to 1977, the respective percentages are 50 and 50, since earlier fiscal years began on July 1 instead of October 1.

6/ Due to revisions in survey methodology and sampling of industrial R&D, data for 1991 and subsequent years may not be comparable to data for previous years. See *Technical Notes*.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges

NOTES: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables. Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1997 and 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry 1995–96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*.

Table B-1B. National expenditures for R&D, from funding sectors to performing sectors: 1991–98 1/

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Funding sector:	Total U.S.	Federal Government								Industry				U&C	Nonprofits			Non-fed. Govt. 5/
Performing sector:	Total U.S.	Total	Federal Govt.	Industry 2/	Industry FFRDCs 2/	U&C	U&C FFRDCs 3/	Nonprofits 2/	Nonprofit FFRDCs 2/	Total	Industry 4/	U&C	Nonprofits	U&C	Total	Nonprofits	U&C	U&C
Data column	[1]	[37]	[2]	[4]	[6]	[8]	[13]	[15]	[18]	[38]	[5]	[10]	[16]	[11]	[39]	[17]	[12]	[9]
Calendar year 6/	[Millions of current dollars]																	
1991 7/.....	160,521	60,564	15,249	24,095	2,277	10,448	5,120	2,679	696	92,484	90,580	1,224	680	3,411	2,585	1,252	1,333	1,477
1992.....	164,933	60,694	15,853	22,369	2,353	11,307	5,259	2,806	748	96,404	94,388	1,300	716	3,558	2,770	1,342	1,428	1,507
1993.....	165,188	60,351	16,532	20,844	1,965	12,133	5,289	2,839	749	96,702	94,591	1,374	737	3,654	2,928	1,418	1,509	1,554
1994.....	168,586	60,700	16,432	20,261	2,202	12,840	5,305	2,900	759	99,324	97,131	1,431	762	3,904	3,081	1,493	1,589	1,576
1995.....	183,045	63,102	17,133	21,178	2,273	13,470	5,388	2,848	812	110,985	108,652	1,506	827	4,112	3,154	1,528	1,626	1,692
1996.....	196,011	63,215	16,574	21,356	2,297	13,962	5,362	2,896	769	123,520	121,015	1,604	901	4,322	3,225	1,562	1,663	1,730
1997 prelim.....	205,561	64,865	16,585	22,061	2,373	14,582	5,459	2,996	810	130,952	128,276	1,717	960	4,667	3,314	1,605	1,708	1,764
1998 prelim.....	220,617	66,636	16,936	22,481	2,418	15,247	5,529	3,219	807	143,714	140,847	1,829	1,038	4,974	3,449	1,671	1,778	1,845
Data column	[19]	[40]	[20]	[22]	[24]	[26]	[31]	[33]	[36]	[41]	[23]	[28]	[34]	[29]	[42]	[35]	[30]	[27]
Calendar year 6/	[Millions of constant 1992 dollars]																	
1991 7/.....	164,942	62,232	15,669	24,759	2,340	10,735	5,261	2,753	715	95,031	93,074	1,257	699	3,505	2,656	1,287	1,369	1,518
1992.....	164,933	60,694	15,853	22,369	2,353	11,307	5,259	2,806	748	96,404	94,388	1,300	716	3,558	2,770	1,342	1,428	1,507
1993.....	160,940	58,799	16,107	20,308	1,914	11,820	5,153	2,766	730	94,215	92,158	1,339	718	3,560	2,852	1,382	1,470	1,514
1994.....	160,421	57,760	15,637	19,280	2,095	12,218	5,048	2,760	723	94,514	92,426	1,362	725	3,715	2,932	1,421	1,512	1,500
1995.....	169,864	58,557	15,900	19,653	2,109	12,500	5,000	2,643	754	102,993	100,828	1,398	768	3,816	2,927	1,418	1,509	1,570
1996.....	177,852	57,359	15,038	19,378	2,084	12,669	4,865	2,627	698	112,077	109,804	1,456	818	3,921	2,926	1,418	1,508	1,570
1997 prelim.....	182,883	57,709	14,755	19,627	2,111	12,974	4,856	2,665	721	116,506	114,124	1,527	854	4,152	2,948	1,428	1,520	1,569
1998 prelim.....	192,611	58,177	14,786	19,627	2,111	13,311	4,827	2,810	705	125,470	122,967	1,596	906	4,342	3,011	1,459	1,552	1,611

1/ The next updates of these data, covering the years 1993–99, will be provided in NSF, *National Patterns of R&D Resources: 1999 Data Update*, which is expected in the fall of 1999.

2/ For 1953–54, expenditures of industry FFRDCs were not separated out from total Federal support to the industrial sector. Thus, the figure for Federal support to the industry includes support to FFRDCs for those two years.

The same is true for expenditures of nonprofit FFRDCs, which is included in Federal support for nonprofit institutions in 1953–54.

3/ Includes all R&D expenditures of FFRDCs administered by academic institutions. In 1996, 99 percent of total funds used were from Federal sources.

4/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

5/ Because of limitations in the survey information, data on non-federal government funding to other performers are not available, and are consequently included in other sectors' support for their own R&D performance. For example, non-federal government support to nonprofits is included in nonprofits' support for their own R&D.

6/ Expenditure levels for academic and Federal Government performers are also in reference to calendar years, which represents a change from previous reporting in *National Patterns of R&D Resources*. These levels are approximations based on fiscal-year data. For academic expenditures, and Federal Government expenditures starting in 1977, the calendar-year approximation is equal to 75 percent of the amount reported in the same fiscal year plus 25 percent of the amount reported in the subsequent fiscal year. For Federal Government expenditures prior to 1977, the respective percentages are 50 and 50, since earlier fiscal years began on July 1 instead of October 1.

7/ Due to revisions in survey methodology and sampling of industrial R&D, data for 1991 and subsequent years may not be comparable to data for previous years. See *Technical Notes*.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges.

NOTES: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables. Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1997 and 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry 1995-96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*.

Table B-2A. National expenditures for basic research, by performing sector and sources of funding: 1991–98 1/

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Performing sector:	Total U.S.	Federal Govt.	Industry			Industry FFRDCs	Universities & colleges 4/						U&C FFRDCs	Other nonprofit institutions				Nonprofit FFRDCs
Funding sector:	Total U.S.	Federal Govt.	Total	Federal Govt. 2/	Industry 3/	Federal Govt. 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 5/	Total	Federal Govt. 2/	Industry	Nonprofits	Federal Govt. 2/
Data column	[43]	[44]	[45]	[46]	[47]	[48]	[49]	[50]	[51]	[52]	[53]	[54]	[55]	[56]	[57]	[58]	[59]	[60]
Calendar year 6/	[Millions of current dollars]																	
1991 7/.....	26,630	2,378	7,376	1,251	6,125	461	11,831	7,274	904	749	2,088	816	2,657	1,850	1,036	313	501	77
1992.....	27,044	2,419	6,528	712	5,816	474	12,710	7,886	933	805	2,202	884	2,867	1,980	1,114	329	537	67
1993.....	28,115	2,623	6,427	466	5,961	492	13,490	8,528	953	843	2,240	925	2,953	2,059	1,153	339	567	72
1994.....	28,917	2,553	6,514	436	6,078	503	14,266	9,057	966	877	2,393	974	2,934	2,073	1,126	351	597	74
1995.....	28,756	2,695	5,569	190	5,379	530	15,034	9,554	1,038	924	2,522	997	2,690	2,162	1,170	381	611	76
1996.....	31,545	2,682	7,498	650	6,848	708	15,728	9,997	1,064	987	2,658	1,022	2,563	2,287	1,248	415	625	79
1997 prelim.....	32,978	2,699	7,674	671	7,003	731	16,727	10,530	1,109	1,079	2,934	1,074	2,654	2,398	1,315	441	642	94
1998 prelim.....	34,426	2,867	7,845	684	7,161	745	17,606	11,009	1,167	1,157	3,147	1,125	2,688	2,564	1,418	478	668	111
Data column	[61]	[62]	[63]	[64]	[65]	[66]	[67]	[68]	[69]	[70]	[71]	[72]	[73]	[74]	[75]	[76]	[77]	[78]
Calendar year 6/	[Millions of constant 1992 dollars]																	
1991 7/.....	27,363	2,444	7,579	1,285	6,294	474	12,157	7,474	929	770	2,146	838	2,730	1,901	1,064	322	515	79
1992.....	27,044	2,419	6,528	712	5,816	474	12,710	7,886	933	805	2,202	884	2,867	1,980	1,114	329	537	67
1993.....	27,392	2,555	6,262	454	5,808	479	13,143	8,309	928	821	2,183	902	2,877	2,006	1,123	330	553	70
1994.....	27,517	2,429	6,198	415	5,784	479	13,575	8,618	919	835	2,277	926	2,792	1,973	1,071	334	568	71
1995.....	26,685	2,501	5,168	176	4,992	492	13,952	8,866	963	857	2,340	925	2,497	2,006	1,086	353	567	70
1996.....	28,623	2,434	6,803	590	6,214	642	14,271	9,071	965	895	2,412	928	2,325	2,076	1,132	376	567	72
1997 prelim.....	29,340	2,402	6,827	597	6,230	651	14,881	9,368	987	960	2,611	956	2,361	2,134	1,170	393	571	84
1998 prelim.....	30,056	2,503	6,849	597	6,252	651	15,371	9,612	1,019	1,010	2,747	982	2,347	2,239	1,238	417	584	97

1/ The next updates of these data, covering the years 1993–99, will be provided in NSF, *National Patterns of R&D Resources: 1999 Data Update*, which is expected in the fall of 1999.

2/ For 1953–63, basic research of industry FFRDCs is not separated out from total Federal support to the industrial sector for basic research. Thus, the figure for Federal support to industry for basic research includes support for basic research at industry FFRDCs for those years. The same is true for basic research by nonprofit FFRDCs in 1953–87, which is included in Federal support for basic research at nonprofit institutions for those years.

3/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

4/ The breakdown of academic basic research performance by sources other than the Federal Government has been estimated for all years.

5/ Includes all R&D expenditures of FFRDCs administered by academic institutions. In 1996, 99 percent of total funds used were from Federal sources.

6/ Expenditure levels for academic and Federal Government performers are also in reference to calendar years, which represents a change from previous reporting in *National Patterns of R&D Resources*. These levels are approximations based on fiscal-year data. For academic expenditures, and Federal Government expenditures starting in 1977, the calendar-year approximation is equal to 75 percent of the amount reported in the same fiscal year plus 25 percent of the amount reported in the subsequent fiscal year. For Federal Government expenditures prior to 1977, the respective percentages are 50 and 50, since earlier fiscal years began on July 1 instead of October 1.

7/ Due to revisions in survey methodology and sampling of industrial R&D, data for 1991 and subsequent years may not be comparable to data for previous years. See *Technical Notes*.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges.

NOTES: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables. Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary or 1997 and 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry, 1995–96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*.

Table B-2B. National expenditures for basic research, from funding sectors to performing sectors: 1991–98 1/

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Funding sector:	Total U.S.	Federal Government								Industry				U&C	Nonprofits			Non-fed. Govt. 6/
Performing sector	Total U.S.	Total	Federal Govt.	Industry 2/	Industry FFRDCs 2/	U&C	U&C FFRDCs 3/	Nonprofits 2/	Nonprofit FFRDCs 2/	Total	Industry 4/	U&C 5/	Nonprofits	U&C 5/	Total	Nonprofits	U&C 5/	U&C 5/
Data column	[43]	[79]	[44]	[46]	[48]	[50]	[55]	[57]	[60]	[80]	[47]	[52]	[58]	[53]	[81]	[59]	[54]	[51]
Calendar year 7/	[Millions of current dollars]																	
1991 8/.....	26,630	15,133	2,378	1,251	461	7,274	2,657	1,036	77	7,187	6,125	749	313	2,088	1,317	501	816	904
1992.....	27,044	15,538	2,419	712	474	7,886	2,867	1,114	67	6,950	5,816	805	329	2,202	1,421	537	884	933
1993.....	28,115	16,287	2,623	466	492	8,528	2,953	1,153	72	7,143	5,961	843	339	2,240	1,493	567	925	953
1994.....	28,917	16,683	2,553	436	503	9,057	2,934	1,126	74	7,306	6,078	877	351	2,393	1,571	597	974	966
1995.....	28,756	16,905	2,695	190	530	9,554	2,690	1,170	76	6,683	5,379	924	381	2,522	1,608	611	997	1,038
1996.....	31,545	17,927	2,682	650	708	9,997	2,563	1,248	79	8,249	6,848	987	415	2,658	1,647	625	1,022	1,064
1997 prelim.....	32,978	18,695	2,699	671	731	10,530	2,654	1,315	94	8,523	7,003	1,079	441	2,934	1,716	642	1,074	1,109
1998 prelim.....	34,426	19,523	2,867	684	745	11,009	2,688	1,418	111	8,795	7,161	1,157	478	3,147	1,793	668	1,125	1,167
Data column	[61]	[82]	[62]	[64]	[66]	[68]	[73]	[75]	[78]	[83]	[65]	[70]	[76]	[71]	[84]	[77]	[72]	[69]
Calendar year 7/	[Millions of constant 1992 dollars]																	
1991 8/.....	27,363	15,550	2,444	1,285	474	7,474	2,730	1,064	79	7,385	6,294	770	322	2,146	1,353	515	838	929
1992.....	27,044	15,538	2,419	712	474	7,886	2,867	1,114	67	6,950	5,816	805	329	2,202	1,421	537	884	933
1993.....	27,392	15,868	2,555	454	479	8,309	2,877	1,123	70	6,959	5,808	821	330	2,183	1,454	553	902	928
1994.....	27,517	15,874	2,429	415	479	8,618	2,792	1,071	71	6,952	5,784	835	334	2,277	1,495	568	926	919
1995.....	26,685	15,688	2,501	176	492	8,866	2,497	1,086	70	6,202	4,992	857	353	2,340	1,493	567	925	963
1996.....	28,623	16,266	2,434	590	642	9,071	2,325	1,132	72	7,485	6,214	895	376	2,412	1,495	567	928	965
1997 prelim.....	29,340	16,632	2,402	597	651	9,368	2,361	1,170	84	7,583	6,230	960	393	2,611	1,527	571	956	987
1998 prelim.....	30,056	17,045	2,503	597	651	9,612	2,347	1,238	97	7,679	6,252	1,010	417	2,747	1,566	584	982	1,019

1/ The next updates of these data, covering the years 1953–99, will be provided in NSF, *National Patterns of R&D Resources: 1999 Data Update*, which is expected in the fall of 1999.

2/ For 1953–63, basic research of industry FFRDCs were not separated out from total Federal support to the industrial sector for basic research. Thus, the figure for Federal support to industry for basic research includes support for basic research at industry FFRDCs for those years. The same is true for basic research by nonprofit FFRDCs in 1953–87, which is included in Federal support for basic research at nonprofit institutions for those years.

3/ Includes all R&D expenditures of FFRDCs administered by academic institutions. In 1996, 99 percent of total funds used were from Federal sources.

4/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

5/ The breakdown of academic basic research performance by sources other than the Federal Government has been estimated for all years.

6/ Because of limitations in the survey information, data on non-federal government funding to other performers are not available, and are consequently included in other sectors' support for their own R&D performance. For example, non-federal government support to nonprofits is included in nonprofits' support for their own R&D.

7/ Expenditure levels for academic and Federal Government performers are also in reference to calendar years, which represents a change from previous reporting in *National Patterns of R&D Resources*. These levels are approximations based on fiscal-year data. For academic expenditures, and Federal Government expenditures starting in 1977, the calendar-year approximation is equal to 75 percent of the amount reported in the same fiscal year plus 25 percent of the amount reported in the subsequent fiscal year. For Federal Government expenditures prior to 1977, the respective percentages are 50 and 50, since earlier fiscal years began on July 1 instead of October 1.

8/ Due to revisions in survey methodology and sampling of industrial R&D, data for 1991 and subsequent years may not be comparable to data for previous years. See *Technical Notes*.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges

NOTES: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables. Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1997 and 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry, 1995–96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*.

Table B-3A. National expenditures for applied research, by performing sector and sources of funding: 1991–98 1/

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Performing sector:	Total U.S.	Federal Govt.	Industry			Industry FFRDCs	Universities & colleges 4/						U&C FFRDCs	Other nonprofit institutions				Nonprofit FFRDCs
Funding sector:	Total U.S.	Federal Govt.	Total	Federal Govt. 2/	Industry 3/	Federal Govt. 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 5/	Total	Federal Govt. 2/	Industry	Nonprofits	Federal Govt. 2/
Data column	[85]	[86]	[87]	[88]	[89]	[90]	[91]	[92]	[93]	[94]	[95]	[96]	[97]	[98]	[99]	[100]	[101]	[102]
Calendar year 6/	[Millions of current dollars]																	
1991 7/.....	38,699	4,093	27,013	5,588	21,425	433	4,543	2,176	470	389	1,085	424	927	1,603	921	231	451	86
1992.....	37,996	4,337	25,660	4,476	21,184	507	4,810	2,375	471	406	1,111	446	940	1,660	933	243	483	81
1993.....	37,325	4,838	24,251	4,295	19,956	435	5,075	2,508	493	436	1,159	479	962	1,661	900	251	511	103
1994.....	36,643	5,003	22,988	3,616	19,372	503	5,296	2,598	500	454	1,239	504	985	1,756	960	259	537	112
1995.....	40,973	5,007	26,919	3,164	23,755	535	5,555	2,721	537	478	1,304	516	1,060	1,766	935	281	550	131
1996.....	43,057	4,815	29,010	3,640	25,370	231	5,783	2,841	546	506	1,364	525	1,275	1,821	952	306	562	122
1997 prelim.....	45,982	4,830	31,653	3,760	27,893	239	5,868	2,868	537	522	1,420	520	1,385	1,884	980	326	578	123
1998 prelim.....	49,753	5,135	34,580	3,832	30,748	243	6,164	3,024	556	551	1,498	535	1,562	1,966	1,012	353	602	104
Data column	[103]	[104]	[105]	[106]	[107]	[108]	[109]	[110]	[111]	[112]	[113]	[114]	[115]	[116]	[117]	[118]	[119]	[120]
Calendar year 6/	[Millions of constant 1992 dollars]																	
1991 7/.....	39,764	4,206	27,757	5,742	22,015	445	4,668	2,236	483	400	1,115	435	952	1,647	946	238	463	89
1992.....	37,996	4,337	25,660	4,476	21,184	507	4,810	2,375	471	406	1,111	446	940	1,660	933	243	483	81
1993.....	36,365	4,714	23,627	4,185	19,443	424	4,944	2,444	480	425	1,129	466	937	1,618	876	244	497	100
1994.....	34,868	4,761	21,875	3,441	18,434	479	5,040	2,472	476	432	1,179	480	937	1,671	913	247	511	106
1995.....	38,023	4,647	24,981	2,936	22,044	496	5,155	2,525	498	443	1,210	478	983	1,639	868	261	510	122
1996.....	39,068	4,369	26,322	3,303	23,020	210	5,247	2,578	496	459	1,238	476	1,157	1,652	864	278	510	111
1997 prelim.....	40,910	4,298	28,161	3,345	24,816	212	5,221	2,552	478	465	1,264	463	1,232	1,676	872	290	514	110
1998 prelim.....	43,438	4,483	30,190	3,345	26,845	212	5,382	2,641	485	481	1,308	468	1,364	1,717	883	308	525	91

1/ The next updates of these data, covering the years 1953–99, will be provided in NSF, *National Patterns of R&D Resources: 1999 Data Update*, which is expected in the fall of 1999.

2/ For 1953–63, applied research of industry FFRDCs is not separated out from total Federal support to the industrial sector for applied research. Thus, the figure for Federal support to industry for applied research includes support for applied research at industry FFRDCs for those years. The same is true for applied research by nonprofit FFRDCs in 1953–87, which is included in Federal support for applied research at nonprofit institutions for those years.

3/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

4/ The breakdown of academic applied research performance by sources other than the Federal Government has been estimated for all years.

5/ Includes all R&D expenditures of FFRDCs administered by academic institutions. In 1996, 99 percent of total funds used were from Federal sources.

6/ Expenditure levels for academic and Federal Government performers are also in reference to calendar years, which represents a change from previous reporting in *National Patterns of R&D Resources*. These levels are approximations based on fiscal-year data. For academic expenditures, and Federal Government expenditures starting in 1977, the calendar-year approximation is equal to 75 percent of the amount reported in the same fiscal year plus 25 percent of the amount reported in the subsequent fiscal year. For Federal Government expenditures prior to 1977, the respective percentages are 50 and 50, since earlier fiscal years began on July 1 instead of October 1.

7/ Due to revisions in survey methodology and sampling of industrial R&D, data for 1991 and subsequent years may not be comparable to data for previous years. See *Technical Notes*.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges.

NOTES: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables. Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1997 and 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry 1995-96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*.

Table B-3B. National expenditures for applied research, from funding sectors to performing sectors: 1991–98 1/

Page 1 of 1

Funding sector:	Total U.S.	Federal Government								Industry				U&C	Nonprofits			Non-fed. Govt. 6/
Performing sector	Total U.S.	Total	Federal Govt.	Industry 2/	Industry FFRDCs 2/	U&C	U&C FFRDCs 3/	Nonprofits 2/	Nonprofit FFRDCs 2/	Total	Industry 4/	U&C 5/	Nonprofits	U&C 5/	Total	Nonprofits	U&C 5/	U&C 5/
Data column	[85]	[121]	[86]	[88]	[90]	[92]	[97]	[99]	[102]	[122]	[89]	[94]	[100]	[95]	[123]	[101]	[96]	[93]
Calendar year 7/	[Millions of current dollars]																	
1991 8/.....	38,699	14,224	4,093	5,588	433	2,176	927	921	86	22,045	21,425	389	231	1,085	874	451	424	470
1992.....	37,996	13,650	4,337	4,476	507	2,375	940	933	81	21,834	21,184	406	243	1,111	929	483	446	471
1993.....	37,325	14,041	4,838	4,295	435	2,508	962	900	103	20,642	19,956	436	251	1,159	989	511	479	493
1994.....	36,643	13,777	5,003	3,616	503	2,598	985	960	112	20,085	19,372	454	259	1,239	1,042	537	504	500
1995.....	40,973	13,553	5,007	3,164	535	2,721	1,060	935	131	24,514	23,755	478	281	1,304	1,066	550	516	537
1996.....	43,057	13,876	4,815	3,640	231	2,841	1,275	952	122	26,183	25,370	506	306	1,364	1,087	562	525	546
1997 prelim.....	45,982	14,185	4,830	3,760	239	2,868	1,385	980	123	28,742	27,893	522	326	1,420	1,098	578	520	537
1998 prelim.....	49,753	14,911	5,135	3,832	243	3,024	1,562	1,012	104	31,652	30,748	551	353	1,498	1,137	602	535	556
Data column	[103]	[124]	[104]	[106]	[108]	[110]	[115]	[117]	[120]	[125]	[107]	[112]	[118]	[113]	[126]	[119]	[114]	[111]
Calendar year 7/	[Millions of constant 1992 dollars]																	
1991 8/.....	39,764	14,616	4,206	5,742	445	2,236	952	946	89	22,652	22,015	400	238	1,115	899	463	435	483
1992.....	37,996	13,650	4,337	4,476	507	2,375	940	933	81	21,834	21,184	406	243	1,111	929	483	446	471
1993.....	36,365	13,680	4,714	4,185	424	2,444	937	876	100	20,112	19,443	425	244	1,129	964	497	466	480
1994.....	34,868	13,109	4,761	3,441	479	2,472	937	913	106	19,113	18,434	432	247	1,179	991	511	480	476
1995.....	38,023	12,577	4,647	2,936	496	2,525	983	868	122	22,749	22,044	443	261	1,210	989	510	478	498
1996.....	39,068	12,591	4,369	3,303	210	2,578	1,157	864	111	23,757	23,020	459	278	1,238	987	510	476	496
1997 prelim.....	40,910	12,620	4,298	3,345	212	2,552	1,232	872	110	25,571	24,816	465	290	1,264	977	514	463	478
1998 prelim.....	43,438	13,019	4,483	3,345	212	2,641	1,364	883	91	27,634	26,845	481	308	1,308	993	525	468	485

1/ The next updates of these data, covering the years 1953–99, will be provided in NSF, *National Patterns of R&D Resources: 1999 Data Update*, which is expected in the fall of 1999.

2/ For 1953–63, applied research of industry FFRDCs were not separated out from total Federal support to the industrial sector for applied research. Thus, the figure for Federal support to industry for applied research includes support for applied research at industry FFRDCs for those years. The same is true for applied research by nonprofit FFRDCs in 1953–87, which is included in Federal support for applied research at nonprofit institutions for those years.

3/ Includes all R&D expenditures of FFRDCs administered by academic institutions. In 1996, 99 percent of total funds used were from Federal sources.

4/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

5/ The breakdown of academic applied research performance by sources other than the Federal Government has been estimated for all years.

6/ Because of limitations in the survey information, data on non-federal government funding to other performers are not available, and are consequently included in other sectors' support for their own R&D performance. For example, non-federal government support to nonprofits is included in nonprofits' support for their own R&D.

7/ Expenditure levels for academic and Federal Government performers are also in reference to calendar years, which represents a change from previous reporting in *National Patterns of R&D Resources*. These levels are approximations based on fiscal-year data. For academic expenditures, and Federal Government expenditures starting in 1977, the calendar-year approximation is equal to 75 percent of the amount reported in the same fiscal year plus 25 percent of the amount reported in the subsequent fiscal year. For Federal Government expenditures prior to 1977, the respective percentages are 50 and 50, since earlier fiscal years began on July 1 instead of October 1.

8/ Due to revisions in survey methodology and sampling of industrial R&D, data for 1991 and subsequent years may not be comparable to data for previous years. See *Technical Notes*.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges.

NOTES: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables. Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1997 and 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry 1995–96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*.

Table B-4A. National expenditures for development, by performing sector and sources of funding: 1991–98 1/

Page 1 of 1

Performing sector:	Total U.S.	Federal Govt.	Industry			Industry FFRDCs	Universities & colleges 4/						U&C FFRDCs	Other nonprofit institutions				Nonprofit FFRDCs
Funding sector:	Total U.S.	Federal Govt.	Total	Federal Govt. 2/	Industry 3/	Federal Govt. 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 5/	Total	Federal Govt. 2/	Industry	Nonprofits	Federal Govt. 2/
Data column	[127]	[128]	[129]	[130]	[131]	[132]	[133]	[134]	[135]	[136]	[137]	[138]	[139]	[140]	[141]	[142]	[143]	[144]
Calendar year 6/	[Millions of current dollars]																	
1991 7/.....	95,193	8,778	80,286	17,256	63,030	1,383	1,518	998	103	85	238	93	1,537	1,159	722	136	301	533
1992.....	99,894	9,098	84,569	17,181	67,388	1,373	1,580	1,045	103	89	244	98	1,452	1,223	758	143	322	599
1993.....	99,749	9,071	84,757	16,083	68,674	1,039	1,659	1,096	108	96	254	105	1,374	1,274	787	147	340	574
1994.....	103,024	8,876	87,890	16,209	71,681	1,196	1,778	1,185	110	100	272	111	1,386	1,325	815	152	358	573
1995.....	113,316	9,431	97,342	17,824	79,518	1,209	1,816	1,194	118	105	286	113	1,638	1,275	743	165	367	606
1996.....	121,410	9,077	105,863	17,066	88,797	1,358	1,769	1,123	120	111	299	115	1,524	1,251	696	180	375	568
1997 prelim.....	126,601	9,055	111,010	17,629	93,380	1,403	1,843	1,184	118	115	312	114	1,420	1,279	701	192	385	593
1998 prelim.....	136,438	8,934	120,903	17,965	102,939	1,430	1,902	1,213	122	121	329	118	1,279	1,398	789	208	401	592
Data column	[145]	[146]	[147]	[148]	[149]	[150]	[151]	[152]	[153]	[154]	[155]	[156]	[157]	[158]	[159]	[160]	[161]	[162]
Calendar year 6/	[Millions of constant 1992 dollars]																	
1991 7/.....	97,814	9,019	82,497	17,731	64,766	1,421	1,559	1,025	106	88	245	96	1,579	1,191	742	140	309	547
1992.....	99,894	9,098	84,569	17,181	67,388	1,373	1,580	1,045	103	89	244	98	1,452	1,223	758	143	322	599
1993.....	97,184	8,838	82,577	15,669	66,908	1,012	1,617	1,068	105	93	248	102	1,338	1,242	766	144	332	560
1994.....	98,035	8,446	83,633	15,424	68,209	1,138	1,692	1,128	104	95	259	105	1,319	1,261	775	145	341	546
1995.....	105,156	8,752	90,332	16,540	73,792	1,122	1,686	1,108	109	97	266	105	1,520	1,183	689	154	340	562
1996.....	110,162	8,236	96,056	15,485	80,571	1,232	1,605	1,019	109	101	272	105	1,383	1,135	631	164	340	515
1997 prelim.....	112,634	8,056	98,763	15,684	83,079	1,248	1,639	1,054	105	102	277	102	1,263	1,138	624	171	343	527
1998 prelim.....	119,118	7,800	105,556	15,684	89,871	1,248	1,660	1,059	106	106	287	103	1,116	1,220	689	181	350	517

1/ The next updates of these data, covering the years 1953–99, will be provided in NSF, *National Patterns of R&D Resources: 1999 Data Update*, which is expected in the fall of 1999.

2/ For 1953–63, development expenditures by industry FFRDCs were not separated out from total Federal support to the industrial sector for development includes support for development at industry FFRDCs for those years.

The same is true for development by nonprofit FFRDCs in 1953–87, which is included in Federal support for development at nonprofit institutions for those years.

3/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

4/ The breakdown of academic development performance by sources other than the Federal Government has been estimated for all years.

5/ Includes all R&D expenditures of FFRDCs administered by academic institutions. In 1996, 99 percent of total funds used were from Federal sources.

6/ Expenditure levels for academic and Federal Government performers are also in reference to calendar years, which represents a change from previous reporting in *National Patterns of R&D Resources*. These levels are approximations based on fiscal-year data. For academic expenditures, and Federal Government expenditures starting in 1977, the calendar-year approximation is equal to 75 percent of the amount reported in the same fiscal year plus 25 percent of the amount reported in the subsequent fiscal year. For Federal Government expenditures prior to 1977, the respective percentages are 50 and 50, since earlier fiscal years began on July 1 instead of October 1.

7/ Due to revisions in survey methodology and sampling of industrial R&D, data for 1991 and subsequent years may not be comparable to data for previous years. See *Technical Notes*.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges

NOTES: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables. Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1997 and 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry 1995–96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*.

Table B-4B. National expenditures for development, from funding sectors to performing sectors: 1991-98 1/

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Funding sector:	Total U.S.	Federal Government								Industry				U&C	Nonprofits			Non-fed. Govt. 6/
Performing sector	Total U.S.	Total	Federal Govt.	Industry 2/	Industry FFRDCs 2/	U&C	U&C FFRDCs 3/	Nonprofits 2/	Nonprofit FFRDCs 2/	Total	Industry 4/	U&C 5/	Nonprofits	U&C 5/	Total	Nonprofits	U&C 5/	U&C 5/
Data column	[127]	[163]	[128]	[130]	[132]	[134]	[139]	[141]	[144]	[164]	[131]	[136]	[142]	[137]	[165]	[143]	[138]	[135]
Calendar year 7/	[Millions of current dollars]																	
1991 8/.....	95,193	31,206	8,778	17,256	1,383	998	1,537	722	533	63,251	63,030	85	136	238	394	301	93	103
1992.....	99,894	31,506	9,098	17,181	1,373	1,045	1,452	758	599	67,620	67,388	89	143	244	420	322	98	103
1993.....	99,749	30,024	9,071	16,083	1,039	1,096	1,374	787	574	68,917	68,674	96	147	254	445	340	105	108
1994.....	103,024	30,240	8,876	16,209	1,196	1,185	1,386	815	573	71,933	71,681	100	152	272	469	358	111	110
1995.....	113,316	32,644	9,431	17,824	1,209	1,194	1,638	743	606	79,788	79,518	105	165	286	480	367	113	118
1996.....	121,410	31,412	9,077	17,066	1,358	1,123	1,524	696	568	89,088	88,797	111	180	299	490	375	115	120
1997 prelim.....	126,601	31,985	9,055	17,629	1,403	1,184	1,420	701	593	93,687	93,380	115	192	312	499	385	114	118
1998 prelim.....	136,438	32,201	8,934	17,965	1,430	1,213	1,279	789	592	103,267	102,939	121	208	329	519	401	118	122
Data Column	[145]	[166]	[146]	[148]	[150]	[152]	[157]	[159]	[162]	[167]	[149]	[154]	[160]	[155]	[168]	[161]	[156]	[153]
Calendar year 7/	[Millions of constant 1992 dollars]																	
1991 8/.....	97,814	32,066	9,019	17,731	1,421	1,025	1,579	742	547	64,993	64,766	88	140	245	404	309	96	106
1992.....	99,894	31,506	9,098	17,181	1,373	1,045	1,452	758	599	67,620	67,388	89	143	244	420	322	98	103
1993.....	97,184	29,252	8,838	15,669	1,012	1,068	1,338	766	560	67,144	66,908	93	144	248	434	332	102	105
1994.....	98,035	28,776	8,446	15,424	1,138	1,128	1,319	775	546	68,449	68,209	95	145	259	446	341	105	104
1995.....	105,156	30,293	8,752	16,540	1,122	1,108	1,520	689	562	74,043	73,792	97	154	266	445	340	105	109
1996.....	110,162	28,502	8,236	15,485	1,232	1,019	1,383	631	515	80,835	80,571	101	164	272	445	340	105	109
1997 prelim.....	112,634	28,456	8,056	15,684	1,248	1,054	1,263	624	527	83,352	83,079	102	171	277	444	343	102	105
1998 prelim.....	119,118	28,114	7,800	15,684	1,248	1,059	1,116	689	517	90,158	89,871	106	181	287	453	350	103	106

1/ The next updates of these data, covering the years 1953-99, will be provided in NSF, *National Patterns of R&D Resources: 1999 Data Update*, which is expected in the fall of 1999.

2/ For 1953-63, development expenditures by industry FFRDCs were not separated out from total Federal support to the industrial sector for development. Thus, the figure for Federal support to industry for development includes support for development at industry FFRDCs for those years. The same is true for development by nonprofit FFRDCs in 1953-87, which is included in Federal support for development at nonprofit institutions for those years.

3/ Includes all R&D expenditures of FFRDCs administered by academic institutions. In 1996, 99 percent of total funds used were from Federal sources.

4/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

5/ The breakdown of academic development performance by sources other than the Federal Government has been estimated for all years.

6/ Because of limitations in the survey information, data on non-federal government funding to other performers are not available, and are consequently included in other sectors' support for their own R&D performance. For example, non-federal government support to nonprofits is included in nonprofits' support for their own R&D.

7/ Expenditure levels for academic and Federal Government performers are also in reference to calendar years, which represents a change from previous reporting in *National Patterns of R&D Resources*. These levels are approximations based on fiscal-year data. For academic expenditures, and Federal Government expenditures starting in 1977, the calendar-year approximation is equal to 75 percent of the amount reported in the same fiscal year plus 25 percent of the amount reported in the subsequent fiscal year. For Federal Government expenditures prior to 1977, the respective percentages are 50 and 50, since earlier fiscal years began on July 1 instead of October 1.

8/ Due to revisions in survey methodology and sampling of industrial R&D, data for 1991 and subsequent years may not be comparable to data for previous years. See *Technical Notes*.

KEY: FFRDCs = federally funded research and development centers
U&C = universities and colleges

NOTES: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables. Data are based on annual reports by performers except for the nonprofit sector; R&D expenditures by nonprofit sector performers have been estimated since 1973 on the basis of a survey conducted in that year. Data are preliminary for 1997 and 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry 1995-96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*.

Table B-5. Gross domestic product and R&D (federally-funded, nonfederal, and total): Comparative measures of growth, 1991–98

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	Gross domestic product (GDP)			R&D				R&D as a percent of GDP		
	GDP [billions of current dollars]	GDP implicit price deflator (1992=1.00)	GDP [billions of constant 1992 dollars]	R&D [millions of current dollars]	R&D [millions of constant 1992 dollars]	Federal support for R&D [millions of constant 1992 dollars]	Nonfederal support for R&D [millions of constant 1992 dollars]	R&D as a percent of GDP	Federal support for R&D as a percent of GDP	Nonfederal support for R&D as a percent of GDP
Data column	[169]	[170]	[171]	[1]	[19]	[40]	[172]	[173]	[174]	[175]
Calendar year										
1991.....	5,917	0.9732	6,080	160,521	164,942	62,232	102,710	2.71	1.02	1.69
1992.....	6,244	1.0000	6,244	164,933	164,933	60,694	104,239	2.64	0.97	1.67
1993.....	6,558	1.0264	6,389	165,188	160,940	58,799	102,141	2.52	0.92	1.60
1994.....	6,947	1.0509	6,611	168,586	160,421	57,760	102,661	2.43	0.87	1.55
1995.....	7,265	1.0776	6,742	183,045	169,864	58,557	111,306	2.52	0.87	1.65
1996.....	7,636	1.1021	6,929	196,011	177,852	57,359	120,493	2.57	0.83	1.74
1997 prelim.....	8,080	1.1240	7,189	205,561	182,883	57,709	125,175	2.54	0.80	1.74
1998 prelim.....	8,456	1.1454	7,383	220,617	192,611	58,177	134,434	2.61	0.79	1.82

NOTE: See the historical database provided in Table B-6 for the full series of historical data, arranged by the same data columns as defined in this and other tables.

SOURCES: Department of Commerce, Bureau of Economic Analysis; Office of Management and Budget, and National Science Foundation/Division of Science Resources Studies tabulations.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
1953.....	5,146	1,015	3,630	1,430	2,200		264	144	38	20	36	27	126	112	58
1954.....	5,605	963	4,070	1,750	2,320		296	162	43	23	39	29	151	127	65
1955.....	6,263	973	4,517	2,057	2,460	123	327	180	49	26	42	31	184	131	64
1956.....	8,479	1,131	6,272	2,995	3,277	333	382	217	55	30	45	35	206	146	71
1957.....	9,883	1,297	7,324	3,928	3,396	407	422	235	62	35	50	39	253	167	79
1958.....	10,886	1,507	8,066	4,436	3,630	323	474	267	70	39	54	43	304	195	95
1959.....	12,454	1,681	9,200	5,217	3,983	418	556	331	78	39	60	48	344	234	125
1960.....	13,669	1,801	10,032	5,604	4,428	477	675	429	88	40	66	54	373	264	148
1961.....	14,514	1,987	10,353	5,685	4,668	555	798	528	98	40	72	60	425	304	169
1962.....	15,577	2,188	11,037	6,008	5,029	426	948	650	109	40	82	68	485	363	200
1963.....	17,446	2,559	12,216	6,856	5,360	414	1,130	799	122	41	93	76	555	408	234
1964.....	19,053	2,966	13,049	7,257	5,792	463	1,325	956	135	40	108	86	629	417	250
1965.....	20,192	3,157	13,812	7,367	6,445	373	1,534	1,120	146	41	130	97	629	472	286
1966.....	22,010	3,308	15,193	7,977	7,216	355	1,767	1,298	158	44	156	111	641	537	329
1967.....	23,279	3,445	15,966	7,946	8,020	419	1,978	1,450	166	50	190	122	685	561	342
1968.....	24,646	3,498	17,014	8,145	8,869	415	2,168	1,579	178	56	219	135	721	596	364
1969.....	25,965	3,790	17,844	7,987	9,857	464	2,253	1,612	203	60	228	150	728	642	388
1970.....	26,235	4,154	17,594	7,306	10,288	473	2,376	1,666	228	63	251	168	732	677	410
1971.....	26,910	4,409	17,829	7,175	10,654	491	2,533	1,742	259	71	282	180	725	709	427
1972.....	28,661	4,676	19,004	7,469	11,535	548	2,694	1,843	276	77	308	191	769	771	472
1973.....	30,905	4,837	20,704	7,600	13,104	545	2,919	1,997	298	87	331	206	829	882	566
1974.....	33,238	5,132	22,239	7,572	14,667	648	3,119	2,096	314	100	380	229	896	995	639
1975.....	35,566	5,561	23,460	7,878	15,582	727	3,489	2,344	340	116	424	266	1,027	1,076	675
1976.....	39,315	5,890	26,107	8,671	17,436	890	3,814	2,566	367	127	463	292	1,206	1,162	711
1977.....	43,233	6,211	28,863	9,523	19,340	962	4,207	2,809	384	147	541	325	1,467	1,248	740
1978.....	48,582	6,962	32,222	10,107	22,115	1,082	4,810	3,194	429	176	651	361	1,772	1,402	830
1979.....	55,269	7,471	37,062	11,354	25,708	1,164	5,540	3,723	477	204	760	377	2,013	1,629	985
1980.....	63,076	7,831	43,228	12,752	30,476	1,277	6,259	4,216	505	250	877	411	2,306	1,700	1,000
1981.....	72,190	8,605	50,425	14,997	35,428	1,385	6,966	4,620	564	303	1,031	449	2,484	1,788	1,038
1982.....	80,633	9,501	57,166	17,061	40,105	1,484	7,463	4,823	619	350	1,159	512	2,544	1,950	1,175
1983.....	89,742	10,830	63,683	19,095	44,588	1,585	8,067	5,100	642	411	1,329	585	2,840	2,138	1,313
1984.....	101,940	11,916	73,061	21,657	51,404	1,739	8,887	5,589	706	496	1,463	633	3,243	2,470	1,550
1985.....	114,344	13,093	82,376	25,333	57,043	1,863	9,997	6,226	793	595	1,680	704	3,616	2,736	1,700
1986.....	119,907	13,504	85,932	26,000	59,932	1,891	11,234	6,870	942	723	1,944	756	3,973	2,835	1,700
1987.....	125,840	13,588	90,160	28,757	61,403	1,995	12,480	7,556	1,044	811	2,215	855	4,287	2,828	1,569
1988.....	133,462	14,342	94,893	28,221	66,672	2,122	13,841	8,392	1,135	903	2,441	969	4,581	3,174	1,762
1989.....	141,550	15,231	99,860	26,359	73,501	2,195	15,304	9,152	1,248	1,028	2,774	1,101	4,756	3,658	2,062
1990.....	151,655	15,671	107,404	25,802	81,602	2,323	16,611	9,786	1,361	1,147	3,096	1,220	4,894	4,117	2,345
1991.....	160,521	15,249	114,675	24,095	90,580	2,277	17,892	10,448	1,477	1,224	3,411	1,333	5,120	4,611	2,679
1992.....	164,933	15,853	116,757	22,369	94,388	2,353	19,100	11,307	1,507	1,300	3,558	1,428	5,259	4,864	2,806
1993.....	165,188	16,532	115,435	20,844	94,591	1,965	20,224	12,133	1,554	1,374	3,654	1,509	5,289	4,995	2,839
1994.....	168,586	16,432	117,393	20,261	97,131	2,202	21,340	12,840	1,576	1,431	3,904	1,589	5,305	5,155	2,900
1995.....	183,045	17,133	129,830	21,178	108,652	2,273	22,406	13,470	1,692	1,506	4,112	1,626	5,388	5,203	2,848
1996.....	196,011	16,574	142,370	21,356	121,015	2,297	23,280	13,962	1,730	1,604	4,322	1,663	5,362	5,359	2,896
1997.....	205,561	16,585	150,337	22,061	128,276	2,373	24,438	14,582	1,764	1,717	4,667	1,708	5,459	5,561	2,996
1998.....	220,617	16,936	163,328	22,481	140,847	2,418	25,672	15,247	1,845	1,829	4,974	1,778	5,529	5,928	3,219

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[16]	[17]	[18]	[19]	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]	[30]
1953.....	26	28		25,502	5,030	17,988	7,086	10,902		1,307	711	190	98	177	131
1954.....	31	31		27,463	4,716	19,941	8,574	11,367		1,448	795	212	111	190	140
1955.....	35	32	9	30,198	4,691	21,779	9,918	11,861	593	1,577	868	234	125	200	149
1956.....	37	38	11	39,492	5,265	29,213	13,950	15,263	1,551	1,777	1,011	255	141	207	163
1957.....	37	51	14	44,559	5,848	33,021	17,710	15,311	1,835	1,900	1,061	280	159	225	176
1958.....	38	62	18	47,936	6,634	35,517	19,533	15,984	1,422	2,085	1,176	308	172	239	190
1959.....	42	67	22	54,266	7,325	40,087	22,732	17,355	1,821	2,423	1,441	341	171	259	210
1960.....	48	68	48	58,742	7,737	43,111	24,083	19,029	2,050	2,902	1,843	376	172	281	230
1961.....	49	86	92	61,656	8,441	43,980	24,150	19,830	2,358	3,391	2,244	415	170	307	255
1962.....	54	109	130	65,339	9,176	46,296	25,201	21,095	1,787	3,978	2,725	457	169	342	284
1963.....	55	119	165	72,329	10,607	50,647	28,425	22,222	1,716	4,683	3,314	504	169	383	313
1964.....	55	112	205	77,832	12,114	53,305	29,645	23,660	1,891	5,412	3,905	550	164	442	349
1965.....	62	124	215	80,897	12,646	55,337	29,515	25,821	1,494	6,147	4,487	586	165	521	388
1966.....	70	138	210	85,741	12,887	59,186	31,075	28,111	1,383	6,882	5,056	616	169	609	431
1967.....	74	145	225	87,877	13,005	60,272	29,996	30,276	1,582	7,467	5,473	627	188	718	461
1968.....	81	151	235	89,168	12,654	61,556	29,468	32,088	1,501	7,844	5,713	645	204	793	489
1969.....	93	161	245	89,721	13,097	61,659	27,598	34,060	1,603	7,783	5,569	700	208	788	518
1970.....	95	172	230	86,074	13,628	57,723	23,970	33,753	1,552	7,796	5,467	748	208	823	551
1971.....	98	184	215	83,936	13,752	55,611	22,380	33,231	1,532	7,899	5,433	806	221	879	560
1972.....	101	198	200	85,759	13,991	56,864	22,349	34,515	1,640	8,060	5,513	824	229	922	571
1973.....	105	211	190	87,550	13,701	58,652	21,530	37,122	1,544	8,268	5,657	845	246	936	584
1974.....	115	241	210	86,400	13,341	57,809	19,683	38,126	1,684	8,107	5,448	816	259	988	595
1975.....	125	276	225	84,499	13,213	55,738	18,717	37,021	1,727	8,290	5,569	808	274	1,008	631
1976.....	135	316	245	88,248	13,222	58,602	19,464	39,138	1,998	8,562	5,759	823	285	1,039	656
1977.....	150	358	275	91,152	13,096	60,854	20,078	40,776	2,028	8,869	5,923	810	309	1,141	686
1978.....	165	407	333	95,466	13,681	63,317	19,860	43,456	2,126	9,452	6,276	842	345	1,279	710
1979.....	180	464	390	100,071	13,527	67,105	20,558	46,547	2,108	10,031	6,741	863	369	1,376	682
1980.....	200	500	475	104,551	12,980	71,653	21,137	50,515	2,117	10,375	6,989	837	414	1,454	681
1981.....	225	525	538	109,362	13,035	76,390	22,719	53,671	2,098	10,553	6,999	854	458	1,562	680
1982.....	250	525	525	114,910	13,540	81,468	24,314	57,154	2,115	10,635	6,874	881	499	1,651	730
1983.....	275	550	600	122,665	14,803	87,046	26,100	60,946	2,166	11,026	6,970	878	561	1,817	800
1984.....	325	595	625	134,274	15,695	96,234	28,526	67,708	2,291	11,705	7,362	929	654	1,926	834
1985.....	375	661	663	145,605	16,672	104,897	32,259	72,638	2,372	12,730	7,928	1,009	758	2,139	896
1986.....	425	710	538	148,805	16,759	106,642	32,266	74,376	2,347	13,941	8,525	1,169	897	2,412	938
1987.....	456	803	501	151,505	16,360	108,548	34,622	73,926	2,402	15,025	9,096	1,257	976	2,667	1,029
1988.....	501	911	510	155,026	16,659	110,225	32,781	77,445	2,465	16,077	9,748	1,319	1,049	2,836	1,126
1989.....	562	1,035	547	157,768	16,976	111,302	29,379	81,923	2,447	17,057	10,200	1,391	1,146	3,092	1,227
1990.....	625	1,147	636	162,025	16,743	114,748	27,566	87,182	2,482	17,746	10,455	1,454	1,226	3,308	1,303
1991.....	680	1,252	696	164,942	15,669	117,833	24,759	93,074	2,340	18,385	10,735	1,518	1,257	3,505	1,369
1992.....	716	1,342	748	164,933	15,853	116,757	22,369	94,388	2,353	19,100	11,307	1,507	1,300	3,558	1,428
1993.....	737	1,418	749	160,940	16,107	112,466	20,308	92,158	1,914	19,703	11,820	1,514	1,339	3,560	1,470
1994.....	762	1,493	759	160,421	15,637	111,707	19,280	92,426	2,095	20,306	12,218	1,500	1,362	3,715	1,512
1995.....	827	1,528	812	169,864	15,900	120,481	19,653	100,828	2,109	20,792	12,500	1,570	1,398	3,816	1,509
1996.....	901	1,562	769	177,852	15,038	129,181	19,378	109,804	2,084	21,124	12,669	1,570	1,456	3,921	1,508
1997.....	960	1,605	810	182,883	14,755	133,751	19,627	114,124	2,111	21,742	12,974	1,569	1,527	4,152	1,520
1998.....	1,038	1,671	807	192,611	14,786	142,594	19,627	122,967	2,111	22,413	13,311	1,611	1,596	4,342	1,552

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[31]	[32]	[33]	[34]	[35]	[36]	[37]	[38]	[39]	[40]	[41]	[42]	[43]	[44]	[45]
1953.....	624	553	285	129	139		2,772	2,246	55	13,736	11,129	270	452	102	151
1954.....	739	620	316	152	152		3,090	2,374	60	15,140	11,630	292	500	96	166
1955.....	885	632	309	169	154	41	3,589	2,521	63	17,305	12,155	304	568	98	189
1956.....	957	678	328	172	177	51	4,963	3,344	73	23,114	15,576	340	705	114	253
1957.....	1,142	751	354	167	230	63	6,213	3,468	90	28,012	15,637	406	800	124	271
1958.....	1,340	859	418	167	273	79	6,950	3,707	105	30,602	16,323	463	925	149	295
1959.....	1,497	1,017	542	183	292	96	8,137	4,064	115	35,454	17,709	502	1,063	165	320
1960.....	1,601	1,135	636	206	292	206	8,879	4,516	122	38,155	19,407	522	1,256	184	376
1961.....	1,805	1,291	718	208	365	389	9,441	4,757	146	40,105	20,208	620	1,476	230	395
1962.....	2,034	1,523	839	227	457	545	10,086	5,123	177	42,308	21,490	741	1,780	252	488
1963.....	2,300	1,692	970	228	493	684	11,582	5,456	195	48,016	22,619	806	2,060	285	522
1964.....	2,569	1,703	1,021	225	458	837	12,726	5,887	198	51,983	24,049	807	2,358	339	507
1965.....	2,521	1,891	1,146	248	497	861	13,147	6,548	221	52,671	26,235	884	2,618	375	563
1966.....	2,496	2,090	1,280	273	538	818	14,117	7,330	249	54,995	28,553	969	2,886	410	593
1967.....	2,584	2,118	1,291	279	547	849	14,511	8,144	267	54,780	30,743	1,009	3,113	434	595
1968.....	2,607	2,156	1,317	293	546	850	14,956	9,006	286	54,110	32,584	1,036	3,361	482	607
1969.....	2,516	2,217	1,339	321	556	847	15,213	10,010	311	52,569	34,590	1,075	3,471	545	581
1970.....	2,401	2,219	1,344	312	564	755	14,970	10,446	340	49,115	34,272	1,115	3,567	562	566
1971.....	2,262	2,210	1,330	306	574	671	15,183	10,823	364	47,359	33,759	1,134	3,697	581	557
1972.....	2,301	2,306	1,411	302	592	598	15,976	11,713	389	47,803	35,046	1,163	3,829	603	554
1973.....	2,348	2,499	1,603	297	598	538	16,563	13,296	417	46,921	37,665	1,182	4,051	652	595
1974.....	2,328	2,585	1,660	299	626	546	17,192	14,882	470	44,690	38,683	1,222	4,438	715	650
1975.....	2,440	2,556	1,604	297	656	535	18,437	15,823	542	43,805	37,592	1,287	4,827	760	677
1976.....	2,708	2,608	1,596	303	709	550	20,179	17,698	608	45,295	39,726	1,365	5,291	850	750
1977.....	3,094	2,632	1,561	316	755	580	21,988	19,637	683	46,359	41,402	1,441	5,925	943	836
1978.....	3,481	2,755	1,631	324	800	653	24,279	22,456	768	47,709	44,126	1,510	6,841	1,044	941
1979.....	3,644	2,949	1,783	326	840	706	27,100	26,092	841	49,067	47,242	1,522	7,736	1,112	1,054
1980.....	3,822	2,818	1,658	332	829	787	29,857	30,926	911	49,489	51,261	1,510	8,651	1,212	1,205
1981.....	3,763	2,708	1,572	341	795	814	33,666	35,956	974	51,001	54,470	1,476	9,741	1,343	1,477
1982.....	3,625	2,779	1,675	356	748	748	37,113	40,705	1,037	52,890	58,009	1,478	10,658	1,522	1,776
1983.....	3,882	2,922	1,794	376	752	820	41,362	45,274	1,135	56,536	61,883	1,552	11,859	1,733	2,106
1984.....	4,272	3,253	2,042	428	784	823	46,319	52,225	1,228	61,010	68,790	1,618	13,176	1,877	2,472
1985.....	4,605	3,484	2,165	477	842	844	52,493	58,013	1,365	66,845	73,874	1,738	14,510	1,947	2,731
1986.....	4,930	3,518	2,110	527	882	667	54,475	61,079	1,466	67,604	75,799	1,820	16,885	2,026	3,930
1987.....	5,162	3,405	1,889	548	967	604	58,254	62,669	1,658	70,135	75,450	1,996	18,213	2,047	4,181
1988.....	5,321	3,687	2,047	582	1,058	592	59,930	68,076	1,880	69,613	79,075	2,183	19,381	2,116	4,163
1989.....	5,300	4,077	2,298	626	1,153	610	60,301	75,091	2,136	67,210	83,695	2,380	21,478	2,309	4,818
1990.....	5,228	4,398	2,506	668	1,225	680	61,457	83,374	2,367	65,660	89,075	2,528	22,556	2,319	4,629
1991.....	5,261	4,738	2,753	699	1,287	715	60,564	92,484	2,585	62,232	95,031	2,656	26,630	2,378	7,376
1992.....	5,259	4,864	2,806	716	1,342	748	60,694	96,404	2,770	60,694	96,404	2,770	27,044	2,419	6,528
1993.....	5,153	4,866	2,766	718	1,382	730	60,351	96,702	2,928	58,799	94,215	2,852	28,115	2,623	6,427
1994.....	5,048	4,905	2,760	725	1,421	723	60,700	99,324	3,081	57,760	94,514	2,932	28,917	2,553	6,514
1995.....	5,000	4,829	2,643	768	1,418	754	63,102	110,985	3,154	58,557	102,993	2,927	28,756	2,695	5,569
1996.....	4,865	4,863	2,627	818	1,418	698	63,215	123,520	3,225	57,359	112,077	2,926	31,545	2,682	7,498
1997.....	4,856	4,948	2,665	854	1,428	721	64,865	130,952	3,314	57,709	116,506	2,948	32,978	2,699	7,674
1998.....	4,827	5,175	2,810	906	1,459	705	66,636	143,714	3,449	58,177	125,470	3,011	34,426	2,867	7,845

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[46]	[47]	[48]	[49]	[50]	[51]	[52]	[53]	[54]	[55]	[56]	[57]	[58]	[59]	[60]
1953.....	19	132		117	77	6	13	5	16	35	48	27	9	12	
1954.....	23	143		142	93	9	15	8	18	42	55	31	11	13	
1955.....	27	162		169	110	13	17	11	20	50	63	36	13	14	
1956.....	37	216		210	136	18	19	14	23	55	74	42	15	17	
1957.....	41	230		250	161	23	22	19	26	68	87	49	15	23	
1958.....	43	252		297	190	30	24	23	30	82	103	59	16	28	
1959.....	72	248		366	244	36	24	27	34	93	120	72	18	30	
1960.....	79	297		459	320	43	24	32	40	102	136	85	21	30	
1961.....	81	314		567	407	51	25	38	46	120	164	105	22	37	
1962.....	143	345		698	513	61	25	46	53	142	200	130	24	46	
1963.....	147	375		861	650	72	25	55	60	167	225	150	25	50	
1964.....	123	384	42	1,037	796	83	25	66	68	195	238	166	25	47	
1965.....	157	406	29	1,179	911	91	26	81	70	213	260	179	29	52	
1966.....	142	451	31	1,342	1,037	102	28	101	73	233	278	188	32	58	
1967.....	168	427	34	1,505	1,156	110	32	126	81	257	289	194	34	61	
1968.....	145	462	35	1,665	1,258	126	37	155	89	276	296	196	37	63	
1969.....	123	458	37	1,732	1,283	146	39	165	99	274	302	192	43	67	
1970.....	122	444	36	1,826	1,309	173	42	190	112	267	311	195	44	72	
1971.....	101	456	33	1,941	1,367	193	48	211	123	256	329	207	45	77	
1972.....	91	463	39	2,030	1,429	195	54	218	134	257	347	216	47	84	
1973.....	96	499	36	2,078	1,471	196	58	217	135	320	371	232	49	90	
1974.....	114	536	49	2,217	1,566	200	63	242	146	402	405	245	54	106	
1975.....	104	573	53	2,445	1,732	212	72	265	165	457	435	255	60	120	
1976.....	116	634	69	2,612	1,883	216	73	272	168	534	477	278	64	135	
1977.....	135	701	75	2,883	2,061	227	84	320	192	667	521	301	70	150	
1978.....	156	785	94	3,255	2,310	251	103	381	210	906	601	351	80	170	
1979.....	161	893	104	3,723	2,648	282	121	450	223	1,050	693	413	85	195	
1980.....	170	1,035	120	4,176	2,961	300	148	522	244	1,167	771	461	95	215	
1981.....	164	1,313	137	4,665	3,296	329	177	602	262	1,284	835	505	105	225	
1982.....	253	1,523	128	4,985	3,438	362	205	679	300	1,366	881	551	115	215	
1983.....	346	1,760	117	5,411	3,618	388	248	803	354	1,536	958	613	125	220	
1984.....	340	2,132	136	5,939	3,958	424	298	878	380	1,709	1,044	656	149	238	
1985.....	358	2,373	131	6,790	4,474	487	366	1,032	432	1,793	1,118	681	172	264	
1986.....	434	3,496	117	7,718	4,994	588	451	1,213	472	1,915	1,179	700	195	284	
1987.....	598	3,583	142	8,518	5,451	650	505	1,380	532	2,086	1,238	707	210	321	
1988.....	656	3,507	337	9,118	5,807	690	549	1,484	589	2,272	1,351	756	230	364	24
1989.....	986	3,832	398	10,004	6,307	750	618	1,667	662	2,371	1,532	860	258	414	46
1990.....	869	3,760	499	10,882	6,767	821	692	1,867	736	2,470	1,693	947	287	459	65
1991.....	1,251	6,125	461	11,831	7,274	904	749	2,088	816	2,657	1,850	1,036	313	501	77
1992.....	712	5,816	474	12,710	7,886	933	805	2,202	884	2,867	1,980	1,114	329	537	67
1993.....	466	5,961	492	13,490	8,528	953	843	2,240	925	2,953	2,059	1,153	339	567	72
1994.....	436	6,078	503	14,266	9,057	966	877	2,393	974	2,934	2,073	1,126	351	597	74
1995.....	190	5,379	530	15,034	9,554	1,038	924	2,522	997	2,690	2,162	1,170	381	611	76
1996.....	650	6,848	708	15,728	9,997	1,064	987	2,658	1,022	2,563	2,287	1,248	415	625	79
1997.....	671	7,003	731	16,727	10,530	1,109	1,079	2,934	1,074	2,654	2,398	1,315	441	642	94
1998.....	684	7,161	745	17,606	11,009	1,167	1,157	3,147	1,125	2,688	2,564	1,418	478	668	111

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[61]	[62]	[63]	[64]	[65]	[66]	[67]	[68]	[69]	[70]	[71]	[72]	[73]	[74]	[75]
1953.....	2,237	503	748	94	654		577	383	29	62	27	77	171	238	134
1954.....	2,451	470	813	113	701		695	457	43	71	38	86	203	269	152
1955.....	2,740	470	911	130	781		816	529	61	80	52	95	239	304	174
1956.....	3,281	529	1,178	172	1,006		978	635	83	87	67	106	254	342	193
1957.....	3,607	559	1,222	185	1,037		1,128	725	104	98	84	117	308	390	219
1958.....	4,071	656	1,299	189	1,110		1,306	837	130	106	101	132	359	451	258
1959.....	4,633	717	1,394	314	1,081		1,593	1,064	156	105	119	149	406	523	314
1960.....	5,396	789	1,616	339	1,276		1,971	1,374	185	104	138	170	436	584	365
1961.....	6,268	975	1,678	344	1,334		2,408	1,728	218	106	161	194	511	697	446
1962.....	7,464	1,057	2,047	600	1,447		2,927	2,153	256	105	192	221	595	839	545
1963.....	8,540	1,180	2,164	609	1,555		3,571	2,693	298	103	227	250	692	933	622
1964.....	9,632	1,385	2,071	502	1,569	172	4,235	3,251	338	100	271	276	798	972	678
1965.....	10,489	1,500	2,256	629	1,627	116	4,725	3,651	365	105	325	278	852	1,040	715
1966.....	11,242	1,597	2,310	553	1,757	121	5,226	4,040	399	109	394	284	907	1,081	730
1967.....	11,751	1,636	2,246	634	1,612	128	5,682	4,363	415	122	477	306	968	1,089	730
1968.....	12,160	1,744	2,196	525	1,671	127	6,025	4,551	457	133	562	322	998	1,071	709
1969.....	11,994	1,884	2,008	425	1,583	128	5,986	4,434	506	136	569	341	945	1,044	663
1970.....	11,702	1,844	1,857	400	1,457	118	5,989	4,295	566	136	623	368	875	1,019	638
1971.....	11,532	1,813	1,737	315	1,422	103	6,054	4,263	603	149	657	383	799	1,026	646
1972.....	11,458	1,803	1,658	272	1,385	117	6,073	4,274	583	162	653	401	769	1,038	646
1973.....	11,476	1,847	1,686	272	1,414	102	5,887	4,168	556	164	616	383	905	1,050	656
1974.....	11,537	1,858	1,690	296	1,393	127	5,764	4,071	520	164	630	379	1,046	1,053	637
1975.....	11,468	1,805	1,608	247	1,361	126	5,808	4,114	504	170	629	392	1,086	1,033	606
1976.....	11,877	1,908	1,684	260	1,423	155	5,863	4,226	484	164	611	378	1,199	1,070	623
1977.....	12,492	1,988	1,763	285	1,478	158	6,079	4,344	478	177	674	405	1,406	1,099	635
1978.....	13,442	2,052	1,849	307	1,543	185	6,395	4,539	493	202	748	413	1,780	1,181	690
1979.....	14,006	2,014	1,908	292	1,617	188	6,741	4,794	510	219	814	404	1,900	1,254	747
1980.....	14,339	2,009	1,997	282	1,716	199	6,921	4,908	498	246	865	405	1,934	1,278	765
1981.....	14,757	2,034	2,238	248	1,989	208	7,067	4,992	498	268	912	397	1,946	1,265	765
1982.....	15,189	2,168	2,531	361	2,170	182	7,104	4,900	516	292	968	428	1,947	1,256	786
1983.....	16,210	2,368	2,879	473	2,406	160	7,395	4,945	530	339	1,098	483	2,099	1,309	837
1984.....	17,355	2,472	3,256	448	2,808	179	7,822	5,214	558	393	1,157	501	2,251	1,375	864
1985.....	18,478	2,480	3,478	456	3,022	167	8,647	5,697	620	465	1,314	550	2,283	1,424	868
1986.....	20,955	2,514	4,877	539	4,339	145	9,578	6,198	730	560	1,506	586	2,377	1,464	869
1987.....	21,927	2,465	5,034	720	4,314	171	10,256	6,562	783	608	1,661	641	2,511	1,491	851
1988.....	22,512	2,458	4,836	762	4,074	391	10,592	6,745	802	637	1,723	684	2,639	1,569	878
1989.....	23,939	2,573	5,370	1,099	4,271	444	11,150	7,030	836	689	1,858	737	2,643	1,708	959
1990.....	24,098	2,477	4,946	928	4,017	533	11,626	7,229	877	739	1,995	786	2,639	1,809	1,012
1991.....	27,363	2,444	7,579	1,285	6,294	474	12,157	7,474	929	770	2,146	838	2,730	1,901	1,064
1992.....	27,044	2,419	6,528	712	5,816	474	12,710	7,886	933	805	2,202	884	2,867	1,980	1,114
1993.....	27,392	2,555	6,262	454	5,808	479	13,143	8,309	928	821	2,183	902	2,877	2,006	1,123
1994.....	27,517	2,429	6,198	415	5,784	479	13,575	8,618	919	835	2,277	926	2,792	1,973	1,071
1995.....	26,685	2,501	5,168	176	4,992	492	13,952	8,866	963	857	2,340	925	2,497	2,006	1,086
1996.....	28,623	2,434	6,803	590	6,214	642	14,271	9,071	965	895	2,412	928	2,325	2,076	1,132
1997.....	29,340	2,402	6,827	597	6,230	651	14,881	9,368	987	960	2,611	956	2,361	2,134	1,170
1998.....	30,056	2,503	6,849	597	6,252	651	15,371	9,612	1,019	1,010	2,747	982	2,347	2,239	1,238

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[76]	[77]	[78]	[79]	[80]	[81]	[82]	[83]	[84]	[85]	[86]	[87]	[88]	[89]	[90]
1953.....	45	59		259	154	28	1,285	761	136	1,286	347	726	288	438	
1954.....	54	64		285	169	31	1,395	826	149	1,375	330	814	322	492	
1955.....	63	68		320	192	34	1,542	923	163	1,509	333	928	368	560	
1956.....	70	79		383	250	40	1,783	1,163	185	1,924	387	1,268	474	794	
1957.....	68	104		443	267	49	1,995	1,203	221	2,409	446	1,670	678	992	
1958.....	70	123		522	292	58	2,299	1,286	255	2,752	516	1,911	774	1,137	
1959.....	78	131		646	290	64	2,815	1,264	280	2,933	577	1,991	813	1,178	
1960.....	90	129		769	342	70	3,304	1,471	299	3,059	615	2,029	833	1,196	
1961.....	93	157		943	361	83	4,004	1,534	352	3,115	668	1,977	812	1,165	
1962.....	101	193		1,180	394	99	4,950	1,653	414	3,688	709	2,449	1,011	1,438	
1963.....	104	207		1,398	425	110	5,796	1,761	457	3,855	809	2,457	1,007	1,450	
1964.....	102	192		1,661	434	115	6,785	1,771	468	4,189	947	2,538	978	1,560	62
1965.....	116	208		1,863	461	122	7,464	1,848	487	4,361	994	2,612	992	1,620	46
1966.....	125	226		2,040	511	131	7,948	1,991	510	4,638	1,012	2,790	986	1,804	53
1967.....	128	230		2,241	493	142	8,461	1,862	536	4,838	1,069	2,832	983	1,849	83
1968.....	134	228		2,392	536	152	8,653	1,938	550	5,141	1,112	3,037	956	2,081	87
1969.....	149	232		2,454	540	166	8,480	1,867	573	5,448	1,229	3,192	920	2,272	95
1970.....	144	236		2,490	530	184	8,171	1,737	604	5,742	1,334	3,330	952	2,378	97
1971.....	140	240		2,545	549	200	7,938	1,712	623	5,818	1,355	3,348	907	2,441	67
1972.....	141	251		2,634	564	218	7,882	1,688	652	6,098	1,434	3,407	845	2,562	107
1973.....	139	255		2,806	606	225	7,950	1,716	638	6,662	1,527	3,715	883	2,832	110
1974.....	140	276		3,091	653	252	8,035	1,697	654	7,312	1,652	4,168	905	3,263	120
1975.....	143	285		3,361	705	285	7,984	1,674	677	8,048	1,912	4,431	991	3,440	139
1976.....	144	303		3,729	771	303	8,370	1,731	681	8,964	2,068	4,945	1,033	3,912	167
1977.....	148	316		4,181	855	342	8,816	1,803	722	9,653	2,081	5,424	1,113	4,311	212
1978.....	157	334		4,861	968	380	9,552	1,902	747	10,695	2,242	6,065	1,195	4,870	235
1979.....	154	353		5,487	1,099	418	9,936	1,989	757	12,073	2,415	6,975	1,305	5,670	250
1980.....	157	356		6,091	1,278	459	10,096	2,119	762	13,725	2,546	8,175	1,625	6,550	275
1981.....	159	341		6,729	1,595	487	10,193	2,416	738	16,389	2,731	10,401	2,042	8,359	298
1982.....	164	306		7,258	1,843	515	10,344	2,627	734	18,261	2,802	11,956	2,593	9,363	367
1983.....	171	301		7,961	2,133	574	10,882	2,915	784	20,323	2,991	13,513	3,227	10,286	414
1984.....	197	314		8,676	2,579	618	11,428	3,398	815	22,481	2,961	15,218	3,677	11,541	547
1985.....	220	337		9,384	2,911	696	11,950	3,707	887	25,389	3,135	17,625	4,717	12,908	630
1986.....	242	353		10,186	4,142	756	12,641	5,141	938	27,225	3,204	19,131	4,049	15,082	629
1987.....	252	387		11,031	4,297	854	13,281	5,174	1,028	27,818	3,366	19,190	4,037	15,153	623
1988.....	268	423	28	11,968	4,286	953	13,902	4,979	1,107	29,466	3,362	20,377	3,846	16,531	371
1989.....	288	461	52	13,278	4,708	1,075	14,799	5,248	1,199	32,304	3,566	22,317	4,324	17,993	374
1990.....	307	490	69	13,935	4,739	1,194	14,888	5,063	1,276	34,981	3,652	24,399	5,967	18,432	386
1991.....	322	515	79	15,133	7,187	1,317	15,550	7,385	1,353	38,699	4,093	27,013	5,588	21,425	433
1992.....	329	537	67	15,538	6,950	1,421	15,538	6,950	1,421	37,996	4,337	25,660	4,476	21,184	507
1993.....	330	553	70	16,287	7,143	1,493	15,868	6,959	1,454	37,325	4,838	24,251	4,295	19,956	435
1994.....	334	568	71	16,683	7,306	1,571	15,874	6,952	1,495	36,643	5,003	22,988	3,616	19,372	503
1995.....	353	567	70	16,905	6,683	1,608	15,688	6,202	1,493	40,973	5,007	26,919	3,164	23,755	535
1996.....	376	567	72	17,927	8,249	1,647	16,266	7,485	1,495	43,057	4,815	29,010	3,640	25,370	231
1997.....	393	571	84	18,695	8,523	1,716	16,632	7,583	1,527	45,982	4,830	31,653	3,760	27,893	239
1998.....	417	584	97	19,523	8,795	1,793	17,045	7,679	1,566	49,753	5,135	34,580	3,832	30,748	243

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[91]	[92]	[93]	[94]	[95]	[96]	[97]	[98]	[99]	[100]	[101]	[102]	[103]	[104]	[105]
1953.....	132	58	30	6	28	10	46	35	14	11	10		6,370	1,720	3,598
1954.....	137	60	31	7	28	10	55	40	16	13	11		6,736	1,614	3,988
1955.....	139	61	32	8	28	10	67	43	18	14	11		7,277	1,606	4,474
1956.....	147	67	33	10	27	11	75	49	21	14	14		8,963	1,800	5,906
1957.....	146	63	34	11	27	11	90	58	24	14	20		10,860	2,009	7,529
1958.....	150	65	35	12	27	11	106	69	30	14	25		12,118	2,272	8,415
1959.....	161	72	37	12	28	12	120	85	43	15	27		12,779	2,512	8,675
1960.....	182	91	38	13	29	12	125	108	63	17	28		13,144	2,641	8,719
1961.....	195	101	40	13	29	12	140	135	83	17	35		13,232	2,838	8,398
1962.....	211	114	40	13	30	13	159	162	98	19	45		15,471	2,972	10,273
1963.....	228	128	42	14	32	13	178	183	115	19	49		15,984	3,354	10,187
1964.....	244	135	44	14	36	16	203	196	130	19	47		17,111	3,866	10,368
1965.....	291	166	47	13	41	24	205	213	140	21	52		17,470	3,980	10,465
1966.....	340	201	46	14	46	33	210	234	153	24	57		18,068	3,942	10,869
1967.....	381	230	47	15	54	36	222	251	166	25	60		18,263	4,034	10,691
1968.....	404	251	44	16	55	38	226	276	186	28	62		18,601	4,021	10,988
1969.....	412	251	49	16	55	41	212	308	210	32	66		18,824	4,248	11,030
1970.....	439	273	49	17	54	46	215	328	225	33	70		18,839	4,377	10,925
1971.....	487	299	58	19	63	48	213	349	241	34	74		18,146	4,226	10,443
1972.....	571	355	70	19	78	49	223	357	243	35	79		18,247	4,291	10,194
1973.....	719	455	85	25	95	59	215	376	257	36	83		18,872	4,327	10,524
1974.....	765	457	94	30	114	69	184	423	290	40	93		19,008	4,295	10,834
1975.....	892	532	107	36	133	85	211	463	315	43	105		19,121	4,542	10,527
1976.....	1,029	590	127	44	161	108	249	506	338	48	120		20,121	4,643	11,100
1977.....	1,096	616	131	49	185	116	297	543	355	53	135		20,352	4,387	11,436
1978.....	1,215	660	146	58	222	129	324	614	409	55	150		21,016	4,405	11,918
1979.....	1,363	750	161	68	257	127	360	710	480	60	170		21,860	4,373	12,629
1980.....	1,574	895	168	83	292	137	421	734	489	65	180		22,749	4,220	13,550
1981.....	1,750	950	192	103	352	153	422	786	521	75	190		24,828	4,138	15,757
1982.....	1,879	983	210	119	393	174	433	825	550	85	190		26,024	3,993	17,039
1983.....	2,051	1,088	208	133	431	190	473	880	585	95	200		27,778	4,089	18,470
1984.....	2,288	1,208	231	162	479	207	548	918	594	110	214		29,611	3,900	20,045
1985.....	2,473	1,280	251	188	532	223	579	947	581	127	238		32,330	3,992	22,444
1986.....	2,707	1,362	290	223	599	233	554	1,000	600	144	256		33,786	3,976	23,742
1987.....	3,071	1,549	323	251	685	264	532	1,037	593	155	289		33,492	4,052	23,104
1988.....	3,647	1,894	365	290	785	312	547	1,097	599	170	328	66	34,227	3,905	23,669
1989.....	4,115	2,102	409	337	908	360	603	1,258	695	191	372	70	36,005	3,975	24,874
1990.....	4,369	2,148	443	374	1,008	397	689	1,405	780	212	413	81	37,373	3,902	26,067
1991.....	4,543	2,176	470	389	1,085	424	927	1,603	921	231	451	86	39,764	4,206	27,757
1992.....	4,810	2,375	471	406	1,111	446	940	1,660	933	243	483	81	37,996	4,337	25,660
1993.....	5,075	2,508	493	436	1,159	479	962	1,661	900	251	511	103	36,365	4,714	23,627
1994.....	5,296	2,598	500	454	1,239	504	985	1,756	960	259	537	112	34,868	4,761	21,875
1995.....	5,555	2,721	537	478	1,304	516	1,060	1,766	935	281	550	131	38,023	4,647	24,981
1996.....	5,783	2,841	546	506	1,364	525	1,275	1,821	952	306	562	122	39,068	4,369	26,322
1997.....	5,868	2,868	537	522	1,420	520	1,385	1,884	980	326	578	123	40,910	4,298	28,161
1998.....	6,164	3,024	556	551	1,498	535	1,562	1,966	1,012	353	602	104	43,438	4,483	30,190

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[106]	[107]	[108]	[109]	[110]	[111]	[112]	[113]	[114]	[115]	[116]	[117]	[118]	[119]	[120]
1953.....	1,427	2,170		653	287	147	31	138	50	227	173	69	55	50	
1954.....	1,578	2,411		670	295	153	36	137	49	267	196	78	64	54	
1955.....	1,774	2,700		669	292	155	40	133	49	321	207	87	68	53	
1956.....	2,208	3,698		682	310	153	44	124	51	348	226	95	65	65	
1957.....	3,057	4,472		657	282	152	51	123	50	406	259	106	63	90	
1958.....	3,408	5,007		659	285	153	53	119	50	468	304	132	62	110	
1959.....	3,542	5,133		702	315	160	53	121	52	522	368	185	65	118	
1960.....	3,580	5,140		783	389	164	56	123	52	538	462	269	73	120	
1961.....	3,449	4,949		829	428	169	55	125	52	595	571	350	72	149	
1962.....	4,241	6,032		883	477	169	56	127	55	666	677	409	80	189	
1963.....	4,175	6,012		946	530	172	58	131	55	738	759	477	79	203	
1964.....	3,995	6,373	253	996	549	181	56	145	64	827	801	531	78	192	
1965.....	3,974	6,490	184	1,167	666	187	52	166	95	820	853	561	84	208	
1966.....	3,841	7,028	206	1,323	783	181	53	179	128	818	910	594	93	222	
1967.....	3,711	6,980	313	1,439	867	178	58	203	134	838	948	627	94	227	
1968.....	3,459	7,529	315	1,462	909	161	58	198	137	817	999	673	101	224	
1969.....	3,179	7,851	328	1,424	868	168	55	189	143	731	1,064	726	111	228	
1970.....	3,123	7,802	318	1,439	896	161	55	177	150	704	1,076	738	108	230	
1971.....	2,829	7,614	209	1,517	933	181	58	197	148	664	1,087	750	106	231	
1972.....	2,528	7,666	320	1,709	1,063	209	58	234	146	666	1,067	726	105	236	
1973.....	2,501	8,023	312	2,036	1,290	241	69	268	168	608	1,065	728	102	235	
1974.....	2,352	8,482	312	1,988	1,189	245	79	297	179	479	1,100	754	104	242	
1975.....	2,354	8,173	330	2,120	1,265	253	86	316	201	501	1,100	748	102	249	
1976.....	2,319	8,781	375	2,311	1,324	286	98	361	242	558	1,135	758	108	269	
1977.....	2,347	9,089	447	2,311	1,299	276	102	389	244	627	1,145	748	112	285	
1978.....	2,348	9,570	462	2,388	1,297	287	114	437	253	637	1,206	803	108	295	
1979.....	2,363	10,266	453	2,469	1,358	292	123	465	230	652	1,286	869	109	308	
1980.....	2,694	10,857	456	2,609	1,483	278	138	483	226	698	1,216	810	108	298	
1981.....	3,093	12,663	451	2,651	1,439	291	156	533	232	640	1,191	790	114	288	
1982.....	3,695	13,343	523	2,677	1,400	300	169	560	248	617	1,176	784	121	271	
1983.....	4,411	14,060	566	2,804	1,488	285	182	590	260	647	1,203	800	130	273	
1984.....	4,843	15,202	720	3,014	1,591	304	214	631	273	722	1,210	782	145	282	
1985.....	6,007	16,437	802	3,149	1,629	319	240	677	284	738	1,206	740	162	303	
1986.....	5,025	18,717	781	3,360	1,691	360	276	743	289	687	1,241	745	179	317	
1987.....	4,860	18,243	750	3,697	1,865	388	302	824	318	640	1,248	714	186	348	
1988.....	4,467	19,202	431	4,236	2,200	424	337	912	362	635	1,274	695	198	381	76
1989.....	4,819	20,055	417	4,587	2,343	455	375	1,012	402	672	1,402	774	213	415	78
1990.....	6,375	19,692	412	4,668	2,294	473	399	1,077	424	736	1,501	833	227	441	87
1991.....	5,742	22,015	445	4,668	2,236	483	400	1,115	435	952	1,647	946	238	463	89
1992.....	4,476	21,184	507	4,810	2,375	471	406	1,111	446	940	1,660	933	243	483	81
1993.....	4,185	19,443	424	4,944	2,444	480	425	1,129	466	937	1,618	876	244	497	100
1994.....	3,441	18,434	479	5,040	2,472	476	432	1,179	480	937	1,671	913	247	511	106
1995.....	2,936	22,044	496	5,155	2,525	498	443	1,210	478	983	1,639	868	261	510	122
1996.....	3,303	23,020	210	5,247	2,578	496	459	1,238	476	1,157	1,652	864	278	510	111
1997.....	3,345	24,816	212	5,221	2,552	478	465	1,264	463	1,232	1,676	872	290	514	110
1998.....	3,345	26,845	212	5,382	2,641	485	481	1,308	468	1,364	1,717	883	308	525	91

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

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Year	[121]	[122]	[123]	[124]	[125]	[126]	[127]	[128]	[129]	[130]	[131]	[132]	[133]	[134]	[135]
1953.....	753	455	20	3,730	2,256	99	3,409	567	2,753	1,123	1,630		16	8	3
1954.....	782	512	21	3,833	2,510	103	3,730	537	3,090	1,405	1,685		17	9	3
1955.....	846	582	21	4,079	2,807	102	4,186	543	3,523	1,785	1,738		19	10	4
1956.....	1,022	818	25	4,761	3,808	116	5,850	631	5,084	2,817	2,267		25	14	4
1957.....	1,300	1,017	31	5,859	4,586	140	6,675	728	5,790	3,616	2,174		26	12	5
1958.....	1,491	1,163	36	6,565	5,121	160	7,210	842	6,183	3,942	2,241		27	12	6
1959.....	1,624	1,205	39	7,076	5,252	170	8,458	940	7,307	4,750	2,557		30	14	6
1960.....	1,726	1,226	40	7,416	5,269	172	9,355	1,003	8,104	5,169	2,935		34	19	6
1961.....	1,803	1,195	47	7,660	5,076	201	9,924	1,090	8,536	5,347	3,189		36	21	7
1962.....	2,090	1,470	58	8,765	6,167	243	10,110	1,227	8,527	5,281	3,246		40	23	8
1963.....	2,237	1,483	62	9,273	6,148	258	11,531	1,465	9,651	6,116	3,535		40	22	8
1964.....	2,454	1,593	63	10,022	6,506	256	12,507	1,680	10,004	6,156	3,848	359	44	26	8
1965.....	2,543	1,654	76	10,186	6,627	303	13,214	1,789	10,637	6,218	4,419	298	64	43	8
1966.....	2,615	1,842	90	10,185	7,174	350	14,486	1,886	11,810	6,849	4,961	271	86	60	9
1967.....	2,752	1,889	96	10,390	7,132	361	15,328	1,943	12,539	6,795	5,744	302	92	64	9
1968.....	2,818	2,125	100	10,194	7,688	361	16,144	1,904	13,370	7,044	6,326	293	99	70	8
1969.....	2,917	2,320	107	10,079	8,017	371	17,046	2,016	14,071	6,944	7,127	332	108	77	8
1970.....	3,096	2,428	116	10,157	7,965	380	16,926	2,258	13,698	6,232	7,466	340	112	84	6
1971.....	3,081	2,494	122	9,611	7,778	379	17,395	2,473	13,924	6,167	7,757	391	105	76	7
1972.....	3,206	2,616	128	9,594	7,828	382	18,733	2,639	15,043	6,533	8,510	402	93	59	11
1973.....	3,447	2,893	142	9,766	8,194	403	20,192	2,657	16,394	6,621	9,773	399	122	70	17
1974.....	3,609	3,333	162	9,381	8,665	420	21,488	2,765	17,421	6,553	10,868	479	137	73	20
1975.....	4,100	3,519	190	9,741	8,361	450	22,691	2,890	18,352	6,783	11,569	535	152	80	21
1976.....	4,444	4,004	228	9,976	8,987	512	25,059	2,972	20,412	7,522	12,890	654	173	93	24
1977.....	4,674	4,413	251	9,855	9,303	529	27,655	3,188	22,603	8,275	14,328	675	227	133	26
1978.....	5,064	4,983	279	9,952	9,792	548	31,047	3,676	25,216	8,756	16,460	753	340	224	32
1979.....	5,560	5,798	297	10,067	10,498	538	35,460	3,944	29,033	9,888	19,145	810	454	325	34
1980.....	6,251	6,698	317	10,361	11,102	525	40,701	4,072	33,848	10,957	22,891	882	510	361	37
1981.....	6,964	8,537	343	10,551	12,933	520	46,060	4,530	38,547	12,791	25,756	950	551	375	42
1982.....	7,727	9,567	364	11,012	13,634	518	51,713	5,178	43,434	14,215	29,219	989	599	402	46
1983.....	8,779	10,514	390	11,999	14,372	533	57,560	6,106	48,064	15,522	32,542	1,054	605	393	46
1984.....	9,535	11,814	422	12,560	15,561	555	66,284	7,078	55,371	17,640	37,731	1,056	660	423	51
1985.....	10,922	13,224	461	13,908	16,839	587	74,444	8,011	62,020	20,258	41,762	1,102	734	472	55
1986.....	10,398	15,449	489	12,904	19,172	607	75,796	8,275	62,871	21,517	41,354	1,145	809	513	64
1987.....	10,699	15,558	554	12,881	18,732	666	79,809	8,176	66,789	24,122	42,667	1,230	890	556	71
1988.....	10,685	16,992	640	12,411	19,737	743	84,615	8,864	70,353	23,719	46,634	1,414	1,076	691	80
1989.....	11,734	18,520	733	13,078	20,643	817	87,768	9,355	72,725	21,049	51,676	1,423	1,185	743	90
1990.....	13,702	19,018	810	14,639	20,318	865	94,118	9,700	78,376	18,966	59,410	1,438	1,359	872	97
1991.....	14,224	22,045	874	14,616	22,652	899	95,193	8,778	80,286	17,256	63,030	1,383	1,518	998	103
1992.....	13,650	21,834	929	13,650	21,834	929	99,894	9,098	84,569	17,181	67,388	1,373	1,580	1,045	103
1993.....	14,041	20,642	989	13,680	20,112	964	99,749	9,071	84,757	16,083	68,674	1,039	1,659	1,096	108
1994.....	13,777	20,085	1,042	13,109	19,113	991	103,024	8,876	87,890	16,209	71,681	1,196	1,778	1,185	110
1995.....	13,553	24,514	1,066	12,577	22,749	989	113,316	9,431	97,342	17,824	79,518	1,209	1,816	1,194	118
1996.....	13,876	26,183	1,087	12,591	23,757	987	121,410	9,077	105,863	17,066	88,797	1,358	1,769	1,123	120
1997.....	14,185	28,742	1,098	12,620	25,571	977	126,601	9,055	111,010	17,629	93,380	1,403	1,843	1,184	118
1998.....	14,911	31,652	1,137	13,019	27,634	993	136,438	8,934	120,903	17,965	102,939	1,430	1,902	1,213	122

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[136]	[137]	[138]	[139]	[140]	[141]	[142]	[143]	[144]	[145]	[146]	[147]	[148]	[149]	[150]
1953.....	1	3	1	46	29	17	6	6		16,894	2,807	13,642	5,565	8,077	
1954.....	1	3	1	55	32	18	7	7		18,277	2,631	15,140	6,884	8,256	
1955.....	1	3	1	68	34	19	8	7		20,181	2,616	16,986	8,607	8,380	
1956.....	2	3	1	76	35	20	8	7		27,248	2,937	23,680	13,121	10,559	
1957.....	2	4	2	95	37	21	8	8		30,092	3,280	26,105	16,303	9,802	
1958.....	3	4	2	117	42	25	8	9		31,747	3,705	27,226	17,358	9,868	
1959.....	3	4	2	131	51	32	9	10		36,854	4,096	31,839	20,697	11,142	
1960.....	3	5	2	146	69	49	10	10		40,202	4,308	34,826	22,213	12,613	
1961.....	2	5	2	165	97	73	10	14		42,156	4,628	36,262	22,715	13,547	
1962.....	2	6	2	185	132	103	11	18		42,408	5,147	35,768	22,152	13,616	
1963.....	2	6	2	210	165	134	11	20		47,806	6,074	40,012	25,357	14,656	
1964.....	2	6	2	231	188	159	11	18		51,089	6,863	40,866	25,147	15,719	1,467
1965.....	2	7	4	212	215	183	12	20		52,939	7,165	42,616	24,912	17,704	1,194
1966.....	2	9	5	198	236	199	14	23		56,432	7,347	46,007	26,681	19,326	1,056
1967.....	2	10	6	206	247	208	15	24		57,863	7,335	47,335	25,651	21,684	1,140
1968.....	4	9	9	219	259	217	16	26		58,407	6,889	48,372	25,485	22,887	1,060
1969.....	5	8	10	243	277	231	18	28		58,903	6,965	48,621	23,994	24,627	1,147
1970.....	5	7	10	251	268	220	18	30		55,533	7,408	44,941	20,446	24,495	1,115
1971.....	5	8	9	257	246	194	19	33		54,258	7,712	43,431	19,236	24,195	1,220
1972.....	3	12	8	290	267	213	19	35		56,054	7,897	45,012	19,548	25,464	1,203
1973.....	5	19	12	295	326	268	20	38		57,202	7,527	46,442	18,756	27,686	1,130
1974.....	6	24	15	309	377	314	21	42		55,856	7,189	45,285	17,034	28,251	1,245
1975.....	8	27	16	359	403	330	22	51		53,910	6,866	43,602	16,115	27,486	1,271
1976.....	10	30	16	424	425	341	23	61		56,250	6,671	45,818	16,884	28,934	1,468
1977.....	14	37	17	503	459	359	27	73		58,307	6,721	47,655	17,447	30,209	1,423
1978.....	15	48	22	542	520	403	30	87		61,008	7,224	49,550	17,206	32,344	1,480
1979.....	15	53	27	603	617	483	35	99		64,205	7,141	52,567	17,903	34,664	1,467
1980.....	18	64	30	719	670	525	40	105		67,463	6,750	56,105	18,162	37,943	1,462
1981.....	23	77	34	778	704	549	45	110		69,777	6,863	58,396	19,377	39,018	1,439
1982.....	26	86	38	745	769	599	50	120		73,697	7,379	61,898	20,258	41,640	1,409
1983.....	29	95	42	832	900	715	55	130		78,677	8,346	65,697	21,217	44,481	1,441
1984.....	36	105	46	986	1,133	925	65	143		87,307	9,323	72,933	23,235	49,698	1,391
1985.....	41	117	49	1,244	1,334	1,100	75	159		94,797	10,201	78,976	25,797	53,180	1,403
1986.....	49	131	51	1,504	1,193	938	85	171		94,063	10,269	78,023	26,703	51,320	1,421
1987.....	55	150	58	1,670	1,055	771	91	193		96,086	9,843	80,411	29,042	51,369	1,481
1988.....	64	172	68	1,762	726	407	100	219	420	98,287	10,296	81,720	27,551	54,169	1,642
1989.....	74	199	79	1,782	868	507	112	248	430	97,824	10,427	81,058	23,461	57,597	1,586
1990.....	82	221	87	1,735	1,019	619	125	275	490	100,553	10,364	83,735	20,263	63,472	1,536
1991.....	85	238	93	1,537	1,159	722	136	301	533	97,814	9,019	82,497	17,731	64,766	1,421
1992.....	89	244	98	1,452	1,223	758	143	322	599	99,894	9,098	84,569	17,181	67,388	1,373
1993.....	96	254	105	1,374	1,274	787	147	340	574	97,184	8,838	82,577	15,669	66,908	1,012
1994.....	100	272	111	1,386	1,325	815	152	358	573	98,035	8,446	83,633	15,424	68,209	1,138
1995.....	105	286	113	1,638	1,275	743	165	367	606	105,156	8,752	90,332	16,540	73,792	1,122
1996.....	111	299	115	1,524	1,251	696	180	375	568	110,162	8,236	96,056	15,485	80,571	1,232
1997.....	115	312	114	1,420	1,279	701	192	385	593	112,634	8,056	98,763	15,684	83,079	1,248
1998.....	121	329	118	1,279	1,398	789	208	401	592	119,118	7,800	105,556	15,684	89,871	1,248

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns* : Columns 1–175

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Year	[151]	[152]	[153]	[154]	[155]	[156]	[157]	[158]	[159]	[160]	[161]	[162]	[163]	[164]	[165]
1953.....	77	41	13	5	13	5	227	141	82	30	30		1,760	1,637	7
1954.....	83	43	16	5	14	5	268	154	86	34	34		2,023	1,693	8
1955.....	92	47	18	6	16	5	325	162	89	39	34		2,423	1,747	8
1956.....	116	66	19	9	16	6	355	161	91	37	33		3,558	2,277	8
1957.....	115	54	23	10	19	9	428	165	92	36	36		4,471	2,184	10
1958.....	120	54	25	13	19	9	513	183	108	35	40		4,937	2,252	11
1959.....	129	62	25	13	19	9	569	222	139	39	44		5,867	2,569	12
1960.....	147	80	27	12	20	9	626	294	208	43	43		6,384	2,948	12
1961.....	154	88	28	8	21	8	700	412	310	42	59		6,695	3,201	16
1962.....	168	95	32	8	24	8	774	552	430	46	76		6,818	3,259	20
1963.....	166	91	33	8	25	8	870	684	556	46	83		7,947	3,548	22
1964.....	181	105	32	8	26	9	945	768	650	45	74		8,611	3,861	20
1965.....	255	170	33	8	30	14	848	859	731	48	80		8,741	4,433	24
1966.....	333	234	36	8	36	19	771	917	773	55	90		9,463	4,977	28
1967.....	345	243	34	8	39	22	778	931	783	57	91		9,518	5,761	30
1968.....	357	252	28	13	34	31	792	937	785	58	94		9,747	6,346	35
1969.....	374	267	26	17	29	35	840	955	796	62	97		9,842	7,150	38
1970.....	367	275	21	16	23	33	822	879	722	59	98		9,384	7,489	40
1971.....	328	237	23	14	25	29	800	767	605	59	103		9,557	7,781	42
1972.....	277	176	32	10	35	24	866	799	637	57	105		10,135	8,532	43
1973.....	345	199	47	13	53	33	835	922	758	57	108		10,310	9,798	50
1974.....	355	189	51	16	62	38	803	979	815	55	109		10,493	10,895	57
1975.....	361	191	51	18	64	38	852	957	784	52	121		10,977	11,599	67
1976.....	389	209	53	23	67	36	951	954	765	52	137		12,006	12,923	77
1977.....	479	279	55	30	78	36	1,061	968	757	57	154		13,133	14,369	90
1978.....	669	440	62	29	94	44	1,064	1,021	791	59	171		14,353	16,505	109
1979.....	821	588	61	27	97	49	1,093	1,116	874	63	179		16,053	19,195	126
1980.....	845	598	61	30	106	50	1,191	1,111	870	66	174		17,516	22,949	135
1981.....	835	568	64	34	117	51	1,178	1,066	831	68	167		19,973	25,824	144
1982.....	854	573	66	37	123	54	1,061	1,096	853	71	171		22,128	29,295	158
1983.....	827	538	63	40	129	57	1,137	1,230	977	75	178		24,622	32,626	172
1984.....	869	557	67	47	138	60	1,299	1,492	1,218	86	188		28,108	37,832	188
1985.....	935	602	70	53	149	62	1,584	1,698	1,401	95	202		32,187	41,878	208
1986.....	1,004	637	79	61	163	63	1,866	1,480	1,163	105	212		33,892	41,488	222
1987.....	1,072	669	85	66	181	70	2,010	1,270	928	110	232		36,524	42,813	251
1988.....	1,249	803	93	74	200	79	2,047	844	473	116	254	488	37,278	46,798	287
1989.....	1,320	828	100	82	222	88	1,986	967	565	125	277	480	35,289	51,862	327
1990.....	1,452	931	104	88	236	93	1,854	1,089	661	134	294	524	33,820	59,617	362
1991.....	1,559	1,025	106	88	245	96	1,579	1,191	742	140	309	547	31,206	63,251	394
1992.....	1,580	1,045	103	89	244	98	1,452	1,223	758	143	322	599	31,506	67,620	420
1993.....	1,617	1,068	105	93	248	102	1,338	1,242	766	144	332	560	30,024	68,917	445
1994.....	1,692	1,128	104	95	259	105	1,319	1,261	775	145	341	546	30,240	71,933	469
1995.....	1,686	1,108	109	97	266	105	1,520	1,183	689	154	340	562	32,644	79,788	480
1996.....	1,605	1,019	109	101	272	105	1,383	1,135	631	164	340	515	31,412	89,088	490
1997.....	1,639	1,054	105	102	277	102	1,263	1,138	624	171	343	527	31,985	93,687	499
1998.....	1,660	1,059	106	106	287	103	1,116	1,220	689	181	350	517	32,201	103,267	519

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-6. Historical database for *National Patterns*: Columns 1–175

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Year	[166]	[167]	[168]	[169]	[170]	[171]	[172]	[173]	[174]	[175]
1953.....	8,722	8,112	35	380	0.2018	1,881.6	11,765	1.36	0.73	0.63
1954.....	9,912	8,295	39	381	0.2041	1,868.2	12,324	1.47	0.81	0.66
1955.....	11,684	8,425	39	415	0.2074	2,001.4	12,893	1.51	0.86	0.64
1956.....	16,570	10,605	38	438	0.2147	2,040.1	16,379	1.94	1.13	0.80
1957.....	20,158	9,848	45	461	0.2218	2,078.4	16,548	2.14	1.35	0.80
1958.....	21,738	9,916	48	467	0.2271	2,057.7	17,334	2.33	1.49	0.84
1959.....	25,563	11,194	52	507	0.2295	2,210.0	18,812	2.46	1.60	0.85
1960.....	27,436	12,668	52	527	0.2327	2,263.0	20,587	2.60	1.69	0.91
1961.....	28,441	13,598	68	545	0.2354	2,314.4	21,551	2.66	1.73	0.93
1962.....	28,598	13,670	84	585	0.2384	2,454.7	23,031	2.66	1.72	0.94
1963.....	32,947	14,710	91	617	0.2412	2,559.7	24,313	2.83	1.88	0.95
1964.....	35,176	15,772	83	663	0.2448	2,708.3	25,849	2.87	1.92	0.95
1965.....	35,021	17,760	94	719	0.2496	2,881.0	28,226	2.81	1.83	0.98
1966.....	36,862	19,388	109	788	0.2567	3,069.0	30,746	2.79	1.79	1.00
1967.....	35,930	21,749	112	834	0.2649	3,146.8	33,096	2.79	1.74	1.05
1968.....	35,263	22,958	125	911	0.2764	3,294.5	35,058	2.71	1.64	1.06
1969.....	34,010	24,706	131	982	0.2894	3,393.9	37,152	2.64	1.55	1.09
1970.....	30,788	24,570	131	1,036	0.3048	3,397.6	36,959	2.53	1.45	1.09
1971.....	29,810	24,269	132	1,125	0.3206	3,510.3	36,578	2.39	1.35	1.04
1972.....	30,328	25,530	129	1,237	0.3342	3,702.3	37,956	2.32	1.29	1.03
1973.....	29,206	27,755	141	1,383	0.3530	3,916.7	40,628	2.24	1.20	1.04
1974.....	27,275	28,321	147	1,497	0.3847	3,891.1	41,710	2.22	1.15	1.07
1975.....	26,080	27,556	159	1,631	0.4209	3,874.1	40,694	2.18	1.13	1.05
1976.....	26,948	29,008	173	1,819	0.4455	4,083.1	42,953	2.16	1.11	1.05
1977.....	27,689	30,296	190	2,027	0.4743	4,273.5	44,793	2.13	1.08	1.05
1978.....	28,205	32,432	215	2,291	0.5089	4,502.7	47,757	2.12	1.06	1.06
1979.....	29,065	34,754	228	2,558	0.5523	4,630.6	51,004	2.16	1.06	1.10
1980.....	29,033	38,039	224	2,784	0.6033	4,615.0	55,062	2.27	1.07	1.19
1981.....	30,258	39,121	218	3,116	0.6601	4,720.3	58,360	2.32	1.08	1.24
1982.....	31,535	41,749	225	3,242	0.7017	4,620.4	62,020	2.49	1.14	1.34
1983.....	33,655	44,596	235	3,515	0.7316	4,803.9	66,129	2.55	1.18	1.38
1984.....	37,023	49,831	248	3,902	0.7592	5,140.1	73,263	2.61	1.19	1.43
1985.....	40,987	53,328	264	4,181	0.7853	5,323.7	78,760	2.74	1.26	1.48
1986.....	42,059	51,486	275	4,422	0.8058	5,488.0	81,200	2.71	1.23	1.48
1987.....	43,973	51,545	302	4,692	0.8306	5,649.3	81,370	2.68	1.24	1.44
1988.....	43,301	54,359	333	5,050	0.8609	5,865.5	85,413	2.64	1.19	1.46
1989.....	39,333	57,804	365	5,439	0.8972	6,061.9	90,558	2.60	1.11	1.49
1990.....	36,133	63,693	387	5,744	0.9360	6,136.5	96,365	2.64	1.07	1.57
1991.....	32,066	64,993	404	5,917	0.9732	6,079.6	102,710	2.71	1.02	1.69
1992.....	31,506	67,620	420	6,244	1.0000	6,244.4	104,239	2.64	0.97	1.67
1993.....	29,252	67,144	434	6,558	1.0264	6,389.4	102,141	2.52	0.92	1.60
1994.....	28,776	68,449	446	6,947	1.0509	6,610.5	102,661	2.43	0.87	1.55
1995.....	30,293	74,043	445	7,265	1.0776	6,742.2	111,306	2.52	0.87	1.65
1996.....	28,502	80,835	445	7,636	1.1021	6,928.6	120,493	2.57	0.83	1.74
1997.....	28,456	83,352	444	8,080	1.1240	7,188.5	125,175	2.54	0.80	1.74
1998.....	28,114	90,158	453	8,456	1.1454	7,382.6	134,434	2.61	0.79	1.82

NOTE: See Tables B-1 to B-5 for column definitions and NOTES and SOURCE(S). Data are preliminary for 1997–98.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987–95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
Alabama	1987	2,349,977	584,230	1,592,000	900,000	692,000	152,925	85,382	16,449	10,916	29,919	10,259	0	20,822	0
	1989	1,232,429	568,243	428,000	213,000	215,000	215,836	119,693	18,339	16,242	45,106	16,456	0	20,350	0
	1991	1,510,827	700,617	521,000	221,000	300,000	252,998	132,063	27,267	20,348	52,667	20,653	0	36,212	0
	1993	1,967,533	833,137	833,000	406,000	427,000	281,209	161,331	26,991	23,729	48,358	20,800	0	20,187	0
	1995	1,680,828	642,257	686,000	273,000	413,000	334,689	190,330	6,991	29,164	86,664	21,540	0	17,882	0
Alaska	1987	90,429	32,840	10,000	D	D	47,432	21,523	2,999	3,024	17,960	1,926	0	157	0
	1989	117,914	51,178	9,000	D	D	56,701	26,659	2,101	3,039	21,869	3,033	0	1,035	0
	1991	146,091	58,705	18,000	D	D	67,432	34,335	1,926	1,547	28,246	1,378	0	1,954	0
	1993	129,211	47,833	14,000	D	D	66,796	41,616	3,012	4,751	17,412	5	0	582	0
	1995	163,396	60,545	30,000	D	D	72,216	37,285	5,607	5,470	23,850	4	0	635	0
Arizona	1987	1,144,281	83,236	845,000	178,000	667,000	181,263	80,955	8,965	17,456	61,644	12,243	26,000	8,782	0
	1989	1,293,340	118,284	917,000	220,000	697,000	223,834	105,367	7,949	12,500	86,076	11,942	27,600	6,622	0
	1991	1,398,709	132,341	944,000	199,000	745,000	284,128	131,627	7,945	19,519	109,028	16,009	27,400	10,840	0
	1993	1,607,378	206,067	1,042,000	298,000	744,000	310,721	149,803	6,333	18,889	112,596	23,100	40,000	8,590	0
	1995	1,987,119	169,700	1,356,000	620,000	736,000	380,216	210,475	8,080	23,238	126,380	12,043	75,005	6,198	0
Arkansas	1987	195,660	24,196	135,000	D	D	35,529	12,257	9,352	2,829	8,028	3,063	0	935	0
	1989	120,875	25,071	51,000	D	D	43,676	14,213	12,186	4,123	9,521	3,633	0	1,128	0
	1991	198,271	35,180	106,000	D	D	55,081	20,178	13,958	4,514	12,945	3,486	0	2,010	0
	1993	301,143	40,657	185,000	D	D	74,011	25,362	23,666	6,767	14,774	3,442	0	1,475	0
	1995	329,500	57,563	181,000	D	D	87,799	33,348	23,779	7,693	19,717	3,262	0	3,138	0
California	1987	25,520,939	2,011,033	19,475,000	10,963,000	8,512,000	1,554,787	1,066,099	36,570	72,260	289,604	90,254	2,097,000	383,119	0
	1989	30,885,676	2,478,100	23,675,000	12,857,000	10,818,000	1,850,062	1,285,165	43,546	83,218	321,615	116,518	2,385,300	252,148	245,066
	1991	28,346,287	1,885,275	21,279,000	8,911,000	12,368,000	2,146,235	1,436,542	84,176	86,265	389,156	150,096	2,562,800	326,127	146,850
	1993	33,721,294	1,785,138	26,541,000	7,463,000	19,078,000	2,380,144	1,629,545	112,454	99,291	367,857	170,997	2,499,000	338,161	177,851
	1995	36,133,144	1,843,729	28,710,000	6,925,000	21,785,000	2,594,280	1,796,691	107,055	120,080	372,941	197,513	2,377,815	361,960	245,360
Colorado	1987	1,704,333	132,807	1,261,000	282,000	979,000	185,699	136,003	8,771	8,728	17,682	14,515	52,000	72,827	0
	1989	1,648,885	116,787	1,162,000	251,000	911,000	226,555	167,043	10,679	14,381	17,735	16,717	63,300	29,354	50,889
	1991	NA	275,312	D	D	1,751,000	260,587	187,819	12,905	16,481	23,078	20,304	78,300	33,718	72,558
	1993	2,864,058	169,821	2,111,000	252,000	1,859,000	331,081	222,107	18,026	23,651	41,797	25,500	99,000	41,852	111,304
	1995	2,603,149	167,869	1,865,000	274,000	1,591,000	393,809	260,247	21,998	24,470	51,690	35,404	125,310	46,418	4,743

See explanatory information and SOURCE at end of table.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987-95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
Connecticut	1987	2,471,219	17,719	2,216,000	632,000	1,584,000	230,790	155,717	2,495	9,298	39,761	23,519	0	6,710	0
	1989	2,744,751	37,810	2,410,000	680,000	1,730,000	284,410	187,212	5,430	11,630	56,999	23,139	0	12,531	0
	1991	1,917,105	46,602	1,535,000	504,000	1,031,000	320,935	197,120	5,996	16,121	73,778	27,920	0	14,568	0
	1993	2,808,827	52,905	2,373,000	419,000	1,954,000	364,708	220,562	10,067	18,351	80,829	34,899	0	18,214	0
	1995	4,310,652	17,690	3,906,000	389,000	3,517,000	377,225	227,915	18,732	20,327	78,243	32,008	0	9,737	0
Delaware	1987	NA	2,874	D	D	D	31,681	13,662	1,995	3,659	10,117	2,248	0	2,647	0
	1989	NA	3,133	D	D	D	37,194	17,083	2,603	4,073	11,125	2,310	0	2,110	0
	1991	NA	8,605	D	D	D	44,696	20,053	4,024	4,732	12,724	3,163	0	2,883	0
	1993	1,248,672	12,053	1,181,000	24,000	1,157,000	52,627	26,170	3,710	4,857	13,937	3,953	0	2,992	0
	1995	1,148,632	15,477	1,077,000	12,000	1,065,000	53,161	27,352	2,144	3,681	14,560	5,424	0	2,994	0
District of Columbia	1987	NA	1,208,569	D	D	D	85,470	62,968	484	4,192	11,642	6,184	0	100,959	0
	1989	NA	1,521,715	D	D	23,000	111,325	84,274	480	7,924	13,022	5,625	0	136,744	0
	1991	1,736,670	1,432,998	40,000	16,000	24,000	118,398	86,793	463	7,279	12,718	11,145	0	145,274	0
	1993	2,543,172	1,712,811	540,000	21,000	519,000	145,218	100,345	1,038	10,313	18,346	15,176	0	144,543	600
	1995	3,128,187	2,106,208	672,000	17,000	656,000	181,461	132,770	814	13,297	19,937	14,643	0	168,518	0
Florida	1987	3,136,347	719,058	2,133,000	892,000	1,241,000	278,847	129,474	13,889	20,334	98,188	16,962	0	5,442	0
	1989	3,374,947	642,074	2,341,000	1,167,000	1,174,000	385,556	200,742	25,655	20,660	112,906	25,593	0	6,317	0
	1991	3,699,966	657,605	2,599,000	934,000	1,665,000	438,054	220,683	36,736	35,690	116,339	28,606	0	5,307	0
	1993	3,525,284	607,692	2,425,000	970,000	1,455,000	488,551	267,717	31,641	40,565	119,937	28,691	0	4,041	0
	1995	5,222,709	554,440	4,101,000	1,634,000	2,467,000	559,104	317,081	41,466	36,382	135,110	29,065	0	8,165	0
Georgia	1987	1,430,455	96,266	1,001,000	D	D	331,000	151,367	39,621	34,196	95,827	9,989	0	2,189	0
	1989	1,309,760	157,925	719,000	D	D	424,424	210,248	40,141	35,635	126,231	12,169	0	8,411	0
	1991	1,478,861	121,008	868,000	89,000	779,000	484,019	238,664	43,222	40,010	149,645	12,478	0	5,834	0
	1993	1,577,360	159,002	860,000	63,000	797,000	546,960	273,079	39,325	51,968	167,509	15,079	0	11,398	0
	1995	2,112,474	272,178	1,175,000	142,000	1,031,000	657,530	302,390	53,611	55,018	221,785	24,726	0	7,766	0
Hawaii	1987	158,274	23,218	73,000	54,000	19,000	57,345	34,472	19,317	261	2,591	704	0	4,711	0
	1989	123,204	36,400	9,000	2,000	7,000	70,733	40,574	24,759	799	3,686	915	0	7,071	0
	1991	144,656	44,537	11,000	D	D	78,166	44,857	27,321	856	3,391	1,741	0	10,953	0
	1993	380,150	41,703	255,000	D	D	73,961	41,362	27,099	151	3,109	2,240	0	9,486	0
	1995	169,252	62,303	14,000	D	D	78,429	44,238	26,789	299	3,738	3,365	0	14,520	0

See explanatory information and SOURCE at end of table.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987-95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
Idaho	1987	528,396	15,342	488,000	386,000	102,000	24,779	8,988	8,314	2,899	4,436	142	0	275	0
	1989	NA	18,785	D	D	161,000	33,191	12,585	8,112	4,199	8,148	147	0	531	0
	1991	NA	36,666	D	D	D	41,437	15,681	8,604	5,050	11,697	405	0	777	0
	1993	477,563	37,396	391,000	D	D	48,774	17,026	12,550	7,286	11,068	844	0	393	0
	1995	913,961	27,792	827,000	D	D	58,621	19,710	13,615	7,408	16,350	1,538	0	548	0
Illinois	1987	5,337,890	72,532	4,284,000	940,000	3,344,000	498,221	293,929	30,610	23,791	117,826	32,065	444,000	39,137	0
	1989	5,305,752	59,321	4,050,000	D	D	602,558	338,082	33,881	38,990	150,694	40,911	528,400	65,473	0
	1991	6,413,236	68,151	5,027,000	190,000	4,837,000	697,565	361,461	52,573	49,583	177,424	56,524	573,500	47,020	0
	1993	6,777,207	83,136	5,242,000	236,000	5,006,000	757,508	424,745	45,716	44,745	178,026	64,276	649,000	45,563	0
	1995	7,486,236	80,626	5,776,000	146,000	5,630,000	817,640	467,952	46,903	43,048	195,052	64,685	770,554	41,416	0
Indiana	1987	2,197,318	64,245	1,944,000	353,000	1,591,000	188,086	111,413	15,772	17,203	37,627	6,071	0	987	0
	1989	2,120,117	74,520	1,815,000	D	D	227,266	136,040	18,911	18,419	43,658	10,238	0	3,331	0
	1991	2,346,791	92,036	1,988,000	226,000	1,762,000	262,508	143,761	20,347	19,726	61,425	17,249	0	4,247	0
	1993	2,560,252	77,330	2,177,000	D	D	302,811	167,743	20,552	22,535	65,991	25,990	0	3,111	0
	1995	3,162,376	62,061	2,721,000	382,000	2,339,000	375,719	197,095	22,463	34,542	101,283	20,336	0	3,596	0
Iowa	1987	540,156	20,217	343,000	D	D	157,539	76,915	16,653	6,212	49,668	8,091	19,000	400	0
	1989	616,408	20,447	363,000	D	D	209,394	103,360	24,839	14,711	60,863	5,621	21,800	1,767	0
	1991	777,130	26,977	461,000	D	D	259,437	123,858	34,147	14,372	74,471	12,589	26,400	3,316	0
	1993	902,050	30,424	533,000	D	D	298,745	145,006	38,218	17,907	80,919	16,695	37,000	2,881	0
	1995	1,391,005	37,257	998,000	D	D	322,769	163,620	47,279	19,391	77,793	14,686	31,925	1,054	0
Kansas	1987	1,282,752	9,073	1,179,000	D	D	93,931	37,386	20,031	5,433	27,607	3,474	0	748	0
	1989	522,687	9,034	404,000	94,000	310,000	107,856	44,292	24,159	5,187	30,204	4,014	0	1,797	0
	1991	NA	11,961	D	D	D	124,174	43,913	28,967	7,292	39,897	4,105	0	5,219	0
	1993	463,570	12,198	292,000	47,000	245,000	154,103	59,635	36,640	7,527	44,215	6,086	0	5,269	0
	1995	763,702	12,296	569,000	D	D	181,496	70,026	39,353	11,434	52,517	8,166	0	910	0
Kentucky	1987	353,868	26,692	249,000	D	D	78,008	30,778	10,841	6,715	26,545	3,129	0	168	0
	1989	343,099	31,159	226,000	D	226,000	83,998	32,963	7,113	7,516	30,593	5,813	0	1,942	0
	1991	316,616	62,279	154,000	D	D	97,989	38,386	6,122	10,569	38,008	4,904	0	2,348	0
	1993	428,684	15,728	289,000	7,000	282,000	122,409	55,698	6,198	13,575	42,013	4,925	0	1,547	0
	1995	593,797	5,911	452,000	4,000	448,000	134,784	59,811	9,589	16,627	43,883	4,874	0	1,102	0

See explanatory information and SOURCE at end of table.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987-95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
Louisiana	1987	317,932	34,619	134,000	D	D	148,563	54,367	31,850	7,154	42,639	12,553	0	750	0
	1989	385,930	36,410	168,000	D	D	180,032	69,219	40,758	8,193	47,129	14,733	0	1,488	0
	1991	453,098	43,104	172,000	16,000	156,000	235,726	98,860	62,167	15,678	44,184	14,837	0	2,268	0
	1993	469,705	42,557	170,000	D	D	255,171	95,891	64,306	16,508	61,267	17,199	0	1,977	0
	1995	422,967	45,108	61,000	D	D	314,996	135,838	71,898	21,317	66,446	19,497	0	1,863	0
Maine	1987	76,367	5,493	41,000	D	41,000	16,952	7,787	315	2,051	5,740	1,059	0	12,922	0
	1989	72,733	4,394	33,000	D	33,000	19,974	8,288	584	4,002	6,567	533	0	15,365	0
	1991	NA	13,862	D	D	D	27,082	10,062	2,197	4,719	9,504	600	0	16,456	0
	1993	113,937	13,003	59,000	D	D	24,879	8,959	1,711	4,117	9,674	418	0	17,055	0
	1995	345,449	4,238	286,000	D	D	31,901	15,789	2,005	4,158	9,357	592	0	23,310	0
Maryland	1987	4,623,170	2,507,828	1,350,000	608,000	742,000	723,915	576,698	50,425	25,803	59,733	11,256	0	41,427	0
	1989	4,972,713	2,915,588	1,088,000	552,000	536,000	900,007	705,292	61,216	35,556	74,426	23,517	0	68,533	585
	1991	5,736,048	3,332,276	1,203,000	666,000	537,000	1,050,023	787,317	79,047	39,832	113,214	30,613	0	149,107	1,642
	1993	7,530,401	4,116,718	2,076,000	1,287,000	789,000	1,128,066	842,053	90,237	47,604	115,976	32,196	0	204,180	5,437
	1995	6,865,287	4,472,415	1,075,000	287,000	788,000	1,159,866	894,585	75,759	55,111	84,508	49,903	0	156,442	1,564
Massachusetts	1987	7,773,057	575,855	5,492,000	1,468,000	4,024,000	719,581	536,999	18,390	64,806	37,790	61,596	354,000	631,621	0
	1989	7,948,303	401,091	5,825,000	1,691,000	4,134,000	867,521	621,789	18,529	78,727	58,681	89,795	364,100	419,725	70,866
	1991	8,565,279	277,787	6,335,000	1,480,000	4,855,000	953,708	680,168	13,090	90,390	71,025	99,035	389,000	433,698	176,086
	1993	9,497,975	383,885	6,952,000	1,878,000	5,074,000	1,105,791	771,864	15,462	98,270	91,877	128,318	355,000	525,805	175,494
	1995	9,969,508	315,749	7,416,000	1,458,000	5,958,000	1,147,150	824,826	13,240	89,409	92,116	127,559	344,657	587,363	158,589
Michigan	1987	7,919,304	87,364	7,415,000	115,000	7,300,000	396,580	207,729	30,320	25,146	103,830	29,555	0	20,360	0
	1989	9,058,245	71,349	8,468,000	99,000	8,369,000	487,192	263,506	35,983	36,310	116,135	35,258	0	31,704	0
	1991	8,850,565	91,833	8,116,000	89,000	8,027,000	601,189	309,592	42,539	43,684	152,841	52,533	0	41,543	0
	1993	10,777,535	95,717	9,924,000	153,000	9,771,000	699,957	377,278	39,541	47,390	172,114	63,634	0	57,861	0
	1995	13,274,875	82,008	12,388,000	148,000	12,240,000	755,089	417,755	48,961	50,629	180,866	56,878	0	49,778	0
Minnesota	1987	2,529,453	26,388	2,242,000	D	D	222,381	109,003	37,287	11,056	39,371	25,664	0	38,684	0
	1989	2,398,568	31,036	2,066,000	D	D	258,614	132,880	42,542	12,389	43,713	27,090	0	42,918	0
	1991	2,227,672	40,468	1,810,000	150,000	1,660,000	331,471	164,887	53,614	19,270	60,904	32,796	0	45,733	0
	1993	2,922,121	40,129	2,458,000	378,000	2,080,000	332,033	174,716	49,861	21,524	64,840	21,092	0	91,959	0
	1995	3,087,438	30,139	2,636,000	315,000	2,321,000	336,524	194,819	49,543	23,427	46,235	22,500	0	84,775	0

See explanatory information and SOURCE at end of table.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987–95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
Mississippi	1987	236,427	127,489	44,000	D	D	59,882	24,532	16,775	4,282	8,897	5,396	0	5,056	0
	1989	268,090	130,448	56,000	D	D	78,922	35,747	20,493	5,439	9,670	7,573	0	2,720	0
	1991	302,380	157,156	41,000	D	D	100,383	52,853	20,886	8,892	12,132	5,620	0	3,841	0
	1993	324,189	162,622	52,000	D	D	105,739	54,715	21,836	9,824	10,960	8,404	0	3,828	0
	1995	314,710	132,616	66,000	D	D	112,789	62,597	23,778	8,912	11,211	6,291	0	3,305	0
Missouri	1987	2,171,482	46,007	1,905,000	D	D	205,597	113,146	11,753	19,325	49,579	11,794	0	14,878	0
	1989	2,709,978	58,176	2,380,000	D	D	255,009	139,677	14,509	25,151	59,615	16,057	0	16,793	0
	1991	NA	71,220	D	D	D	305,780	165,099	19,061	30,195	67,335	24,090	0	22,217	0
	1993	1,788,896	51,288	1,375,000	D	D	344,566	190,959	18,959	31,492	78,490	24,666	0	18,042	0
	1995	2,498,360	55,445	2,028,000	584,000	1,443,000	397,192	212,750	21,486	36,639	92,974	33,343	0	17,723	0
Montana	1987	54,381	17,763	7,000	0	7,000	29,425	11,299	7,325	3,197	7,604	0	0	193	0
	1989	NA	20,877	D	D	5,000	32,450	11,552	7,919	3,242	9,534	203	0	1,077	0
	1991	NA	26,133	D	D	D	38,149	13,801	8,884	4,406	10,820	238	0	1,340	0
	1993	90,438	27,075	14,000	D	D	48,080	21,399	9,029	3,234	14,011	407	0	1,283	0
	1995	119,109	33,553	17,000	D	D	66,879	27,382	12,914	5,825	20,172	586	0	1,677	0
Nebraska	1987	160,209	21,899	62,000	D	D	74,468	33,275	16,123	6,664	14,893	3,513	0	1,842	0
	1989	181,706	22,074	64,000	D	D	93,506	36,761	22,926	9,098	20,676	4,045	0	2,126	0
	1991	210,756	21,920	59,000	7,000	52,000	123,711	40,597	35,817	7,845	34,780	4,672	0	6,125	0
	1993	294,531	24,730	128,000	14,000	114,000	135,737	38,023	39,576	8,891	36,406	12,841	0	6,064	0
	1995	335,930	23,132	150,000	D	D	157,044	54,746	42,331	10,933	45,536	3,498	0	5,754	0
Nevada	1987	167,996	76,509	57,000	D	D	34,254	18,563	1,973	3,983	8,805	930	0	233	0
	1989	152,642	77,198	29,000	D	D	45,555	26,587	2,682	4,296	10,396	1,594	0	889	0
	1991	261,232	108,614	83,000	63,000	20,000	66,742	38,221	2,608	5,323	19,675	915	0	2,876	0
	1993	218,503	71,044	67,000	D	D	79,124	43,196	4,361	5,245	25,193	1,129	0	1,335	0
	1995	445,028	34,669	322,000	D	D	86,902	47,708	6,460	6,941	24,798	995	0	1,457	0
New Hampshire	1987	164,130	19,006	94,000	D	D	50,928	34,633	2,045	2,081	8,114	4,055	0	196	0
	1989	NA	21,510	D	D	95,000	62,172	41,816	2,646	2,951	9,333	5,426	0	97	0
	1991	NA	88,342	D	D	102,000	78,975	52,833	4,375	3,997	10,225	7,545	0	330	0
	1993	438,620	88,839	248,000	D	D	99,475	67,727	5,846	4,842	11,768	9,292	0	2,306	0
	1995	597,697	30,902	472,000	36,000	436,000	93,073	60,131	3,963	3,919	12,948	12,112	0	1,722	0

See explanatory information and SOURCE at end of table.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987–95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
New Jersey	1987	6,724,917	255,275	6,141,000	457,000	5,684,000	214,696	95,294	37,489	11,780	55,142	14,991	107,000	6,946	0
	1989	7,228,887	429,755	6,381,000	601,000	5,780,000	283,897	119,237	45,150	16,428	82,798	20,284	112,600	21,635	0
	1991	8,777,671	512,928	7,810,000	855,000	6,955,000	352,310	150,044	43,361	19,502	114,157	25,246	90,800	11,528	105
	1993	9,180,997	509,310	8,162,000	378,000	7,784,000	373,816	166,835	36,361	26,115	116,307	28,198	116,000	11,876	7,995
	1995	9,128,185	343,667	8,200,000	197,000	8,002,000	443,371	208,934	39,535	25,861	135,607	33,434	125,685	11,332	4,130
New Mexico	1987	2,392,370	420,821	993,000	906,000	87,000	132,145	75,923	17,908	20,123	14,187	4,004	835,000	11,404	0
	1989	2,679,324	593,878	1,034,000	D	D	136,189	76,777	14,612	16,433	17,860	10,507	902,400	4,857	8,000
	1991	2,589,385	392,967	1,064,000	1,001,000	63,000	170,139	94,309	15,467	19,530	28,762	12,071	947,600	7,241	7,438
	1993	2,751,608	503,783	962,000	D	D	186,750	113,060	13,998	18,743	28,507	12,442	1,084,000	6,762	8,313
	1995	3,295,475	481,047	1,461,000	1,380,000	81,000	230,393	156,554	17,298	10,696	38,562	7,283	1,109,400	6,218	7,417
New York	1987	8,185,452	160,073	6,559,000	3,426,000	13,904,000	1,108,478	758,040	53,349	62,173	126,931	107,985	221,000	136,901	0
	1989	9,877,995	89,334	8,071,000	1,480,000	6,591,000	1,311,643	854,137	68,474	70,598	170,970	147,464	255,200	150,818	0
	1991	10,315,493	173,988	8,268,000	1,558,000	6,710,000	1,419,765	918,063	75,490	85,282	190,624	150,306	283,900	169,570	270
	1993	10,973,876	131,440	8,820,000	1,392,000	7,428,000	1,544,702	1,052,171	75,571	87,804	180,217	148,939	293,000	184,734	0
	1995	10,954,561	117,250	8,651,000	1,821,000	6,831,000	1,702,414	1,107,468	95,941	98,200	206,258	194,547	281,148	202,749	0
North Carolina	1987	2,212,322	129,508	1,741,000	5,000	1,736,000	313,819	195,177	54,897	23,825	25,757	14,163	0	27,995	0
	1989	1,820,827	59,738	1,305,000	5,000	1,300,000	419,848	261,896	61,259	41,375	41,222	14,096	0	36,241	0
	1991	1,965,076	150,956	1,285,000	4,000	1,281,000	501,841	303,921	71,990	55,079	51,758	19,093	0	27,279	0
	1993	2,745,087	174,294	1,929,000	16,000	1,913,000	604,581	377,983	74,041	69,950	63,862	18,745	0	37,212	0
	1995	3,191,790	220,179	2,226,000	15,000	2,212,000	686,609	431,682	97,647	74,086	61,857	21,337	0	59,002	0
North Dakota	1987	116,487	20,343	60,000	D	D	35,912	15,385	13,731	3,578	2,391	827	0	232	0
	1989	75,833	20,217	27,000	D	27,000	27,951	19,396	918	2,521	4,113	1,003	0	665	0
	1991	NA	23,938	D	D	D	48,930	21,570	1,327	2,308	22,336	1,389	0	1,231	0
	1993	91,534	27,220	9,000	D	D	54,175	25,223	1,532	2,173	23,595	1,652	0	1,139	0
	1995	97,606	25,042	12,000	D	D	59,617	27,841	1,534	3,346	25,043	1,853	0	947	0
Ohio	1987	4,934,310	991,290	3,569,000	2,206,000	2,807,000	329,344	193,615	35,038	22,265	47,189	31,237	0	44,676	0
	1989	5,474,881	1,055,523	3,946,000	681,000	3,265,000	427,345	242,559	48,072	37,591	62,068	37,055	0	46,013	0
	1991	5,975,241	688,926	4,726,000	778,000	3,948,000	503,725	284,791	53,079	37,948	73,765	54,142	0	56,590	0
	1993	6,397,650	583,033	5,144,000	1,030,000	4,114,000	593,542	348,166	46,038	47,781	89,146	62,411	0	77,075	0
	1995	5,314,554	599,044	4,001,000	574,000	3,428,000	642,596	375,061	47,690	54,316	106,701	58,828	0	71,914	0

See explanatory information and SOURCE at end of table.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987-95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
Oklahoma	1987	534,354	33,729	384,000	D	D	99,363	25,880	3,463	7,078	57,472	5,470	0	17,262	0
	1989	507,700	46,083	332,000	D	D	113,279	33,067	5,062	5,667	60,063	9,420	0	16,338	0
	1991	604,019	40,970	392,000	2,000	390,000	152,624	42,806	13,593	8,559	74,265	13,401	0	18,425	0
	1993	533,398	34,311	311,000	2,000	309,000	172,968	56,475	22,399	10,320	67,338	16,436	0	15,119	0
	1995	528,764	45,104	288,000	38,000	249,000	186,371	59,504	19,699	11,453	79,107	16,608	0	9,289	0
Oregon	1987	475,890	31,517	294,000	D	D	135,326	81,932	18,645	4,059	16,007	14,683	0	15,047	0
	1989	578,941	42,199	355,000	30,000	325,000	161,215	99,141	20,860	4,857	16,717	19,640	0	20,527	0
	1991	600,175	47,486	349,000	21,000	321,000	179,384	108,849	25,727	6,850	21,519	16,439	0	24,305	0
	1993	773,855	50,795	471,000	32,000	439,000	225,750	134,956	29,762	8,578	34,209	18,245	0	26,310	0
	1995	1,088,654	55,959	741,000	35,000	706,000	258,575	158,076	30,312	11,693	37,453	21,041	0	33,120	0
Pennsylvania	1987	5,633,446	284,237	4,630,000	1,380,000	3,250,000	611,935	385,912	23,559	66,246	85,399	50,819	14,000	93,274	0
	1989	5,790,920	274,016	4,632,000	1,907,000	2,725,000	761,337	468,993	32,466	91,733	109,498	58,647	20,900	102,667	0
	1991	7,620,947	315,003	6,262,000	2,060,000	4,202,000	878,826	552,239	26,532	100,210	141,865	57,980	27,100	137,865	153
	1993	8,277,907	353,951	6,711,000	1,142,000	5,569,000	1,019,006	676,963	20,177	111,569	149,296	61,001	35,000	158,950	0
	1995	6,918,955	227,520	5,331,000	376,000	4,955,000	1,139,531	754,444	34,954	120,303	164,296	65,534	31,525	189,379	0
Rhode Island	1987	553,281	239,969	234,000	D	D	65,516	51,313	2,136	5,380	5,293	1,394	0	13,796	0
	1989	428,168	195,920	139,000	D	D	79,801	56,446	3,276	6,305	11,646	2,128	0	13,447	0
	1991	484,693	226,367	152,000	11,000	141,000	88,448	59,616	5,278	3,709	17,520	2,325	0	17,878	0
	1993	484,236	184,784	176,000	12,000	164,000	103,194	71,515	2,812	3,212	23,481	2,174	0	20,258	0
	1995	896,570	254,302	520,000	D	D	105,501	72,461	3,225	2,479	25,644	1,692	0	16,767	0
South Carolina	1987	640,738	11,527	523,000	D	D	95,811	34,350	14,061	6,184	37,110	4,106	0	10,400	0
	1989	575,597	59,660	386,000	D	D	120,137	41,627	17,421	7,906	44,864	8,319	0	9,800	0
	1991	594,444	13,955	419,000	D	D	151,204	54,045	16,858	15,903	54,011	10,387	0	10,285	0
	1993	713,450	38,208	495,000	D	D	178,174	73,020	16,057	14,242	52,850	22,005	0	2,068	0
	1995	996,261	34,441	739,000	D	D	220,088	109,443	17,899	19,364	53,994	19,388	0	2,732	0
South Dakota	1987	21,311	5,685	4,000	0	4,000	11,395	5,129	4,789	472	739	266	0	231	0
	1989	22,274	5,563	4,000	D	4,000	12,449	6,166	4,905	316	840	222	0	262	0
	1991	32,297	9,470	5,000	D	5,000	15,959	6,917	6,539	310	1,520	673	0	1,868	0
	1993	58,634	13,236	22,000	D	D	22,196	9,100	9,686	486	2,140	784	0	1,202	0
	1995	54,667	13,428	19,000	D	19,000	21,392	10,623	6,772	469	2,341	1,187	0	847	0

See explanatory information and SOURCE at end of table.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987-95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
Tennessee	1987	950,871	125,890	649,000	D	D	155,163	84,030	28,035	11,757	24,124	7,217	9,000	11,818	0
	1989	1,294,796	135,383	930,000	D	D	207,471	127,627	31,365	10,367	28,221	9,891	7,800	14,142	0
	1991	1,142,486	123,708	737,000	D	D	243,763	150,274	32,927	12,359	34,772	13,431	10,400	27,515	100
	1993	1,212,807	86,547	792,000	D	D	277,686	180,177	31,255	15,743	34,150	16,361	11,000	45,574	0
	1995	1,402,742	62,100	1,003,000	D	D	308,155	191,797	35,395	16,345	45,116	19,502	9,612	19,875	0
Texas	1987	5,454,724	340,803	4,261,000	1,784,000	2,477,000	809,781	403,285	92,020	46,903	168,648	98,925	0	43,140	0
	1989	6,581,710	464,111	5,028,000	1,848,000	3,180,000	1,014,305	488,137	123,805	63,575	210,128	128,660	0	75,294	0
	1991	6,635,249	405,267	4,755,000	D	D	1,215,548	550,558	139,019	79,964	283,850	162,157	2,300	257,134	0
	1993	6,965,939	467,760	4,882,000	640,000	4,242,000	1,387,088	682,785	157,954	89,554	292,807	163,988	5,000	224,091	0
	1995	8,384,534	537,508	6,211,000	912,000	5,298,000	1,472,165	747,687	158,886	102,486	296,606	166,500	0	163,001	860
Utah	1987	1,031,253	99,166	809,000	D	D	120,878	81,355	13,412	5,734	16,178	4,199	0	2,209	0
	1989	620,604	66,414	387,000	D	D	164,828	109,053	17,183	5,503	27,822	5,267	0	2,362	0
	1991	664,474	103,269	356,000	51,000	305,000	201,470	137,613	16,756	6,880	33,779	6,442	0	3,735	0
	1993	751,165	140,556	411,000	51,000	360,000	194,685	136,630	13,075	9,303	27,825	7,852	0	4,924	0
	1995	1,144,080	131,138	803,000	178,000	625,000	202,212	140,600	15,431	9,456	28,065	8,660	0	7,730	0
Vermont	1987	282,584	3,710	247,000	0	247,000	31,547	22,289	1,805	2,877	3,330	1,246	0	327	0
	1989	NA	4,404	D	D	D	42,743	28,535	2,500	3,486	5,485	2,737	0	2,639	0
	1991	NA	5,122	D	D	D	46,541	30,860	2,859	4,181	6,395	2,246	0	4,543	0
	1993	342,809	5,601	284,000	D	D	49,839	31,530	2,666	4,573	8,253	2,817	0	3,369	0
	1995	308,180	4,702	248,000	D	D	54,065	32,932	2,454	5,467	9,519	3,693	0	1,413	0
Virginia	1987	2,558,458	883,844	1,342,000	1,068,000	274,000	207,934	116,137	36,400	15,895	29,841	9,661	0	124,680	0
	1989	2,555,475	1,017,754	1,126,000	687,000	439,000	278,065	146,712	49,501	21,953	45,348	14,551	13,200	45,489	74,967
	1991	2,775,919	1,107,423	1,115,000	679,000	436,000	342,476	183,798	51,474	31,899	52,857	22,448	28,600	42,826	139,594
	1993	2,938,617	1,226,598	1,087,000	595,000	492,000	403,201	226,130	46,108	35,822	69,479	25,662	35,000	53,272	133,546
Washington	1987	3,520,818	122,468	3,071,000	D	D	235,927	166,458	5,561	21,183	33,623	9,102	0	91,423	0
	1989	3,224,988	111,220	2,716,000	D	D	276,885	205,150	6,063	21,393	36,126	8,153	0	60,549	60,334
	1991	3,889,660	132,503	3,215,000	D	D	349,667	253,381	11,351	28,107	45,229	11,599	0	72,156	120,334
	1993	5,421,959	113,263	4,689,000	891,000	3,798,000	427,763	312,497	13,693	33,506	52,301	15,766	0	75,104	116,829
	1995	5,240,679	159,837	4,294,000	D	D	485,970	340,327	13,761	39,429	77,212	15,241	0	95,900	204,972

See explanatory information and SOURCE at end of table.

Table B-7. State expenditures for R&D: Performance by sector, categorized by sources of funds: 1987-95

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Performing sector:		Total R&D	Federal Govt.	Industry			Universities & colleges						U&C FFRDCs	Other nonprofit institutions	Nonprofit FFRDCs
Funding sector:		Total R&D	Federal Govt.	Total	Federal Govt. 1/	Industry 2/	Total	Federal Govt.	Non-fed. Govt.	Industry	U&C	Nonprofits	Federal Govt. 3/	Federal Govt. 4/	Federal Govt. 4/
Location	Year 5/	[Thousands of current dollars]													
West Virginia	1987	187,642	56,605	87,000	D	D	26,704	13,011	871	884	10,736	1,202	17,000	333	0
	1989	NA	63,239	D	D	80,000	39,368	17,339	1,255	3,963	15,081	1,730	18,400	2,098	0
	1991	NA	76,078	D	D	69,000	50,772	20,479	1,564	11,170	13,191	4,368	21,900	4,985	0
	1993	279,583	93,059	100,000	D	D	55,021	31,662	2,004	3,973	14,132	3,250	28,000	3,503	0
	1995	475,040	139,595	243,000	D	D	53,399	30,464	2,023	3,160	13,470	4,282	33,047	5,999	0
Wisconsin	1987	1,538,985	21,745	1,217,000	36,000	1,181,000	297,411	170,235	49,800	11,446	42,017	23,913	0	2,829	0
	1989	1,398,630	26,945	1,030,000	32,000	998,000	336,815	197,818	55,372	16,268	43,304	24,053	0	4,870	0
	1991	1,573,365	32,321	1,140,000	24,000	1,116,000	387,621	217,590	64,386	18,715	52,522	34,408	0	13,423	0
	1993	1,851,751	38,190	1,343,000			444,192	255,195	68,410	18,698	53,725	48,164	0	26,369	0
	1995	2,226,046	40,344	1,706,000	33,000	1,673,000	472,982	270,622	42,549	16,873	92,115	50,823	0	6,720	0
Wyoming	1987	35,803	8,146	4,000	0	4,000	17,316	8,701	1,129	1,216	6,176	94	0	6,341	0
	1989	NA	8,519	D	D	D	23,310	13,804	1,539	1,535	6,226	206	0	20,858	0
	1991	41,037	9,339	2,000	D	2,000	23,009	12,782	1,848	2,000	6,140	239	0	6,689	0
	1993	62,907	10,068	15,000	D	D	32,556	14,575	4,111	2,268	10,637	965	0	5,283	0
	1995	86,767	8,669	25,000	D	D	40,470	15,373	3,125	1,930	17,454	2,588	0	12,628	0

1/ Includes performance at industry FFRDCs.

2/ Industry sources of industry R&D expenditures include all non-federal sources of industry R&D expenditures.

3/ Includes total R&D expenditures of FFRDCs administered by academic institutions.

4/ Other sources of support for nonprofit institutions were unavailable.

5/ Industry R&D data are in reference to calendar years; other R&D data are in reference to fiscal years but may serve as approximations to calendar year data.

KEY: FFRDCs = federally funded research and development centers

U&C = universities and colleges

NA = Not available

D = Data withheld to avoid disclosing operations of individual companies, or because of imputations of more than 50 percent

SOURCE: National Science Foundation/Division of Science Resources Studies.

Table B-8. Total R&D and GSP by state: 1995

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Rank in total R&D	State	Total R&D	GSP	Percent R&D/GSP	Rank in R&D/GSP	Percent of U.S. R&D	Cumulative percent of U.S. R&D
		[Millions of dollars]					
	TOTAL, U.S.	183,045	7,228,287	2.53			
1	California.....	36,133	913,474	3.96	7	19.74	19.7
2	Michigan.....	13,275	251,794	5.27	3	7.25	27.0
3	New York.....	10,955	587,714	1.86	24	5.98	33.0
4	Massachusetts.....	9,970	195,874	5.09	4	5.45	38.4
5	New Jersey.....	9,128	266,134	3.43	11	4.99	43.4
6	Texas.....	8,385	514,206	1.63	30	4.58	48.0
7	Illinois.....	7,486	352,932	2.12	19	4.09	52.1
8	Pennsylvania.....	6,919	313,293	2.21	17	3.78	55.9
9	Maryland.....	6,865	137,353	5.00	5	3.75	59.6
10	Ohio.....	5,315	292,103	1.82	25	2.90	62.5
11	Washington.....	5,241	150,001	3.49	10	2.86	65.4
12	Florida.....	5,223	339,033	1.54	31	2.85	68.2
13	Connecticut.....	4,311	118,595	3.63	8	2.35	70.6
14	Virginia.....	3,897	186,986	2.08	20	2.13	72.7
15	New Mexico.....	3,295	40,759	8.09	1	1.80	74.5
16	North Carolina.....	3,192	192,219	1.66	29	1.74	76.3
17	Indiana.....	3,162	148,801	2.13	18	1.73	78.0
18	District of Columbia.....	3,128	49,686	6.30	2	1.71	79.7
19	Minnesota.....	3,087	131,358	2.35	15	1.69	81.4
20	Colorado.....	2,603	107,903	2.41	14	1.42	82.8
21	Missouri.....	2,498	137,483	1.82	25	1.36	84.2
22	Wisconsin.....	2,226	132,704	1.68	28	1.22	85.4
23	Georgia.....	2,112	200,751	1.05	37	1.15	86.5
24	Arizona.....	1,987	103,951	1.91	22	1.09	87.6
25	Alabama.....	1,681	94,988	1.77	27	0.92	88.5
26	Tennessee.....	1,403	134,873	1.04	38	0.77	89.3
27	Iowa.....	1,391	71,362	1.95	21	0.76	90.1
28	Delaware.....	1,149	26,947	4.26	6	0.63	90.7
29	Utah.....	1,144	45,554	2.51	13	0.63	91.3
30	Oregon.....	1,089	80,805	1.35	32	0.59	91.9
31	South Carolina.....	996	85,270	1.17	36	0.54	92.5
32	Idaho.....	914	26,885	3.40	12	0.50	93.0
33	Rhode Island.....	897	25,046	3.58	9	0.49	93.5
34	Kansas.....	764	64,146	1.19	35	0.42	93.9
35	New Hampshire.....	598	31,802	1.88	23	0.33	94.2
36	Kentucky.....	594	90,617	0.66	45	0.32	94.5
37	Oklahoma.....	529	68,611	0.77	40	0.29	94.8
38	West Virginia.....	475	36,039	1.32	33	0.26	95.1
39	Nevada.....	445	48,670	0.91	39	0.24	95.3
40	Louisiana.....	423	112,944	0.37	50	0.23	95.5
41	Maine.....	345	27,748	1.24	34	0.19	95.7
42	Nebraska.....	336	43,673	0.77	40	0.18	95.9
43	Arkansas.....	330	53,358	0.62	46	0.18	96.1
44	Mississippi.....	315	53,647	0.59	47	0.17	96.3
45	Vermont.....	308	13,867	2.22	16	0.17	96.4

See explanatory information and SOURCE at end of table.

Table B-8. Total R&D and GSP by state: 1995

Page 2 of 2

Rank in total R&D	State	Total R&D	GSP	Percent R&D/GSP	Rank in R&D/GSP	Percent of U.S. R&D	Cumulative percent of U.S. R&D
		[Millions of dollars]					
46	Hawaii.....	169	36,034	0.47	49	0.09	96.5
47	Alaska.....	163	23,674	0.69	42	0.09	96.6
48	Montana.....	119	17,722	0.67	43	0.07	96.7
49	North Dakota.....	98	14,477	0.67	43	0.05	96.7
50	Wyoming.....	87	15,761	0.55	48	0.05	96.8
51	South Dakota.....	55	18,662	0.29	51	0.03	96.8
	Other/unknown 1/.....	5,837				3.19	100.0

1/ The "other/unknown" category includes R&D performed within the 50 states, or the District of Columbia, but where the specific location of such performance was not provided by survey respondents. It also includes R&D conducted by organizations within the United States, but where actual performance does not take place in a particular state or the District of Columbia, e.g., research conducted on marine vessels, and research in Puerto Rico. Finally, it also includes a small accounting difference due to the total for the U.S. being based on calendar year data, while data by state pertain to the fiscal year for non-industrial performance.

KEY: GSP = Gross state product

SOURCES: National Science Foundation/Division of Science Resources Studies. Data were derived from NSF/SRS, *Research and Development in Industry: 1995-96*; NSF/SRS, *Academic Research and Development Expenditures, Fiscal Year 1996*; and NSF/SRS, *Federal Funds for Research and Development: Fiscal Years 1996, 1997, and 1998*; and Department of Commerce, Bureau of Economic Analysis.

**Table B-9. Trends in Federal and non-federal
R&D expenditures: 1953-98**

Page 1 of 1

Calendar Year	Federal				Non- federal
	Total Federal	Defense related	Space related	Civilian related	
	[Percent]				
1953.....	53.9	48.0	1.0	4.9	46.1
1954.....	55.1	49.0	1.0	5.1	44.9
1955.....	57.3	48.7	1.0	7.7	42.7
1956.....	58.5	49.7	1.0	7.9	41.5
1957.....	62.9	53.2	0.9	8.8	37.1
1958.....	63.8	53.1	1.1	9.7	36.2
1959.....	65.3	54.2	2.6	8.6	34.7
1960.....	65.0	52.5	3.2	9.3	35.0
1961.....	65.0	50.3	5.6	9.2	35.0
1962.....	64.8	49.0	6.6	9.1	35.2
1963.....	66.4	41.8	13.6	11.0	33.6
1964.....	66.8	37.0	18.9	10.9	33.2
1965.....	65.1	33.2	20.8	11.1	34.9
1966.....	64.1	32.4	19.5	12.2	35.9
1967.....	62.3	35.2	14.3	12.7	37.7
1968.....	60.7	34.7	13.6	12.4	39.3
1969.....	58.6	34.7	11.5	12.4	41.4
1970.....	57.1	33.4	10.3	13.3	42.9
1971.....	56.4	32.7	9.6	14.1	43.6
1972.....	55.7	32.9	7.9	14.9	44.3
1973.....	53.6	32.0	6.7	14.8	46.4
1974.....	51.7	29.2	6.9	15.6	48.3
1975.....	51.8	27.6	7.5	16.8	48.2
1976.....	51.3	26.9	7.6	16.8	48.7
1977.....	50.9	27.1	6.6	17.2	49.1
1978.....	50.0	25.8	6.2	17.9	50.0
1979.....	49.0	24.7	5.6	18.7	51.0
1980.....	47.3	24.2	5.3	17.8	52.7
1981.....	46.6	24.4	5.2	17.0	53.4
1982.....	46.0	26.1	4.9	15.0	54.0
1983.....	46.1	27.7	4.2	14.2	53.9
1984.....	45.4	28.7	3.0	13.8	54.6
1985.....	45.9	29.9	3.1	12.9	54.1
1986.....	45.4	31.5	3.0	10.9	54.6
1987.....	46.3	31.8	3.2	11.4	53.7
1988.....	44.9	30.5	3.4	11.0	55.1
1989.....	42.6	27.9	3.7	11.0	57.4
1990.....	40.5	25.4	4.2	11.0	59.5
1991.....	37.7	22.5	4.5	10.7	62.3
1992.....	36.8	21.6	4.3	10.9	63.2
1993.....	36.5	21.6	4.4	10.6	63.5
1994.....	36.0	19.9	4.4	11.7	64.0
1995.....	34.5	18.6	4.5	11.3	65.5
1996.....	32.3	17.7	4.1	10.5	67.7
1997 prel.....	31.6	17.4	4.1	10.1	68.4
1998 prel.....	30.2	16.4	4.0	9.8	69.8

NOTES: Data are preliminary for 1997 and 1998. Details may not sum to totals because of rounding.

SOURCE: National Science Foundation/Division of Science Resources Studies.

Table B-10. Federal R&D budget authority, by budget function: fiscal years 1980–98

Page 1 of 1

Budget function	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998 [prel.]	1999 [prop.]
	[Millions of current dollars]																			
Total	29,739	33,735	36,115	38,768	44,214	49,887	53,249	57,069	59,106	62,115	63,781	65,898	68,398	69,884	68,331	68,791	69,049	71,653	73,639	75,229
National defense.....	14,946	18,413	22,070	24,936	29,287	33,698	36,926	39,152	40,099	40,665	39,925	39,328	40,061	41,249	37,764	37,204	37,801	39,591	39,871	39,699
Health.....	3,694	3,871	3,869	4,298	4,779	5,418	5,565	6,556	7,076	7,773	8,308	9,226	10,055	10,280	10,993	11,407	11,867	12,670	13,557	14,622
Space research and technology.....	2,738	3,111	2,584	2,134	2,300	2,725	2,894	3,398	3,683	4,555	5,765	6,511	6,744	6,988	7,414	7,916	7,844	7,844	8,265	8,037
Energy 1/.....	3,603	3,501	3,012	2,578	2,581	2,389	2,286	2,053	2,126	2,419	2,726	2,953	3,153	2,677	2,873	2,844	2,521	2,372	1,143	1,470
General science 1/.....	1,233	1,340	1,359	1,502	1,676	1,862	1,873	2,042	2,160	2,373	2,410	2,635	2,659	2,691	2,712	2,794	2,846	2,944	4,210	4,649
Natural resources and environment.....	999	1,061	965	952	963	1,059	1,062	1,133	1,160	1,255	1,386	1,582	1,688	1,802	2,062	1,988	1,802	1,886	2,015	2,013
Transportation.....	887	869	791	876	1,040	1,030	917	908	896	1,064	1,045	1,231	1,523	1,703	1,888	1,833	1,795	1,785	1,920	1,904
Agriculture.....	585	659	693	745	762	836	815	822	882	907	950	1,052	1,155	1,152	1,193	1,194	1,176	1,203	1,243	1,272
Education, training, employment, and social services.....	468	298	228	189	200	220	248	267	285	347	374	433	365	348	373	369	331	373	437	454
International affairs.....	125	160	165	177	192	210	211	223	224	279	375	378	371	382	254	287	252	190	171	175
Veterans benefits and services.....	126	143	139	157	218	193	183	215	195	212	216	219	245	250	265	257	259	267	276	304
Commerce and housing credit.....	101	106	104	107	110	114	111	110	122	128	140	178	192	220	380	525	432	409	385	465
Community and regional development.....	119	104	63	44	46	50	88	99	108	74	67	88	95	57	68	70	50	48	49	62
Administration of justice.....	45	34	31	37	24	47	41	49	51	45	44	51	51	49	46	59	56	59	76	71
Income security.....	47	43	32	32	26	21	14	25	23	27	33	30	37	36	45	43	16	9	19	30
General government.....	22	22	10	6	8	17	14	17	17	15	17	4	4	0	0	1	2	2	2	2

1/ In FY 1998, several DOE programs were reclassified from energy to general science.

NOTES: Data for 1990–97 are actual budget authority. Data for 1998 are preliminary estimates, and data for 1999 are proposed based on the fiscal year 1999 budget.**SOURCE:** National Science Foundation/Division of Science Resources Studies, *Federal R&D Funding by Budget Function: Fiscal Years 1997–99*.

Table B-11. Federal outlays for R&D and other activities, by DoD and non-DoD sources: 1962–98

Page 1 of 1

Year	Federal R&D outlays			All Federal outlays				Ratio R&D to total outlays		
	Total	Dept. of Defense (DoD) R&D outlays	Federal non-DoD R&D outlays	Total on-budget outlays	DoD outlays	Interest on National debt	Non-DoD, non-interest outlays	DoD R&D/DoD total outlays	Total Federal R&D/total outlays	Non-DoD R&D/non-DoD, non-interest outlays
	[Millions of current dollars]							[Percent]		
1962.....	9,837	6,689	3,148	93,286	50,111	7,498	35,677	13.35	10.54	8.82
1963.....	11,365	6,792	4,573	96,352	51,147	8,322	36,883	13.28	11.80	12.40
1964.....	13,796	7,419	6,377	102,794	52,585	8,805	41,404	14.11	13.42	15.40
1965.....	13,840	6,623	7,217	101,699	48,780	9,239	43,680	13.58	13.61	16.52
1966.....	14,918	6,675	8,243	114,817	56,629	10,028	48,160	11.79	12.99	17.12
1967.....	15,962	7,649	8,313	137,040	70,069	11,060	55,911	10.92	11.65	14.87
1968.....	16,172	8,071	8,101	155,798	80,355	12,069	63,374	10.04	10.38	12.78
1969.....	15,660	7,762	7,898	158,436	80,771	13,848	63,817	9.61	9.88	12.38
1970.....	15,153	7,519	7,634	168,042	80,123	15,948	71,971	9.38	9.02	10.61
1971.....	15,409	7,639	7,770	177,346	77,497	16,783	83,066	9.86	8.69	9.35
1972.....	16,303	8,238	8,065	193,824	77,645	17,584	98,595	10.61	8.41	8.18
1973.....	17,035	8,529	8,506	200,118	75,033	19,629	105,456	11.37	8.51	8.07
1974.....	17,434	8,960	8,474	217,270	77,864	23,969	115,437	11.51	8.02	7.34
1975.....	18,536	9,284	9,252	271,892	84,852	26,047	160,993	10.94	6.82	5.75
1976.....	19,988	9,341	10,647	302,183	87,917	29,539	184,727	10.62	6.61	5.76
1977.....	21,443	10,210	11,233	328,502	95,147	32,551	200,804	10.73	6.53	5.59
1978.....	24,532	10,726	13,806	369,089	102,259	37,861	228,969	10.49	6.65	6.03
1979.....	26,325	11,045	15,280	404,054	113,605	44,860	245,589	9.72	6.52	6.22
1980.....	30,235	13,469	16,766	476,618	130,912	54,877	290,829	10.29	6.34	5.76
1981.....	34,168	15,739	18,429	543,053	153,868	71,062	318,123	10.23	6.29	5.79
1982.....	34,660	18,363	16,297	594,351	180,714	87,114	326,523	10.16	5.83	4.99
1983.....	35,900	20,566	15,334	661,272	204,410	91,673	365,189	10.06	5.43	4.20
1984.....	40,986	23,850	17,136	686,061	220,928	114,432	350,701	10.80	5.97	4.89
1985.....	47,216	28,165	19,051	769,615	245,154	133,622	390,839	11.49	6.14	4.87
1986.....	52,141	33,396	18,745	806,962	265,480	140,377	401,105	12.58	6.46	4.67
1987.....	53,256	34,732	18,524	810,290	273,966	143,942	392,382	12.68	6.57	4.72
1988.....	56,100	35,605	20,495	861,798	281,935	159,253	420,610	12.63	6.51	4.87
1989.....	60,760	37,819	22,941	932,760	294,880	180,661	457,219	12.83	6.51	5.02
1990.....	63,810	38,247	25,563	1,028,098	289,755	200,212	538,131	13.20	6.21	4.75
1991.....	62,183	35,330	26,853	1,082,713	262,389	214,763	605,561	13.46	5.74	4.43
1992.....	64,728	35,504	29,224	1,129,343	286,892	223,059	619,392	12.38	5.73	4.72
1993.....	68,378	37,666	30,712	1,142,827	278,561	225,599	638,667	13.52	5.98	4.81
1994.....	66,453	35,474	30,979	1,182,359	268,622	232,160	681,577	13.21	5.62	4.55
1995.....	68,432	35,356	33,076	1,227,065	259,442	265,474	702,149	13.63	5.58	4.71
1996.....	68,439	36,936	31,503	1,259,608	253,187	277,597	728,824	14.59	5.43	4.32
1997.....	71,073	37,702	33,371	1,290,609	258,311	285,227	747,071	14.60	5.51	4.47
1998.....	71,379	36,446	34,933	1,348,140	251,385	289,424	807,331	14.50	5.29	4.33

NOTES: DoD R&D outlays are not strictly comparable to "defense R&D" as they do not include Department of Energy defense-related activities. Data are preliminary for 1998.

SOURCES: National Science Foundation/Division of Science Resources Studies, U.S. Department of Commerce, and Office of Management and Budget, *Historical Tables: Budget of the United States Government, Fiscal Year 1999*.

Table B-12. Federal obligations for research and development, by agency: fiscal years 1985–98

Page 1 of 2

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Preliminary	
													1997	1998
	[Millions of current dollars]													
Total, all agencies.....	48,359.6	51,412.4	55,253.7	56,769.4	61,406.5	63,559.5	61,295.2	65,592.6	67,314.0	67,257.0	68,736.4	67,662.6	69,972.9	69,838.4
Department of Agriculture, total.....	943.0	928.5	947.9	1,016.6	1,038.3	1,108.4	1,236.6	1,327.1	1,327.8	1,399.9	1,380.2	1,302.0	1,406.8	1,376.0
Agricultural Research Service.....	469.7	463.4	478.6	505.7	523.5	545.5	591.0	627.1	627.2	678.7	683.3	675.2	687.1	696.8
Cooperative State Research Service.....	284.3	269.0	270.7	298.4	307.3	324.2	376.8	418.2	418.6	429.0	417.7	362.4	448.8	406.4
Forest Service.....	113.1	113.3	126.7	135.5	131.4	158.6	174.7	180.7	182.7	193.1	193.5	177.9	179.8	179.8
Other.....	75.8	82.8	71.8	77.0	76.1	80.0	94.2	101.1	99.3	99.1	85.7	86.5	91.0	93.0
Department of Commerce, total.....	398.8	399.2	402.2	388.9	397.9	438.2	489.6	651.2	656.3	826.1	1,136.0	1,067.5	1,044.8	1,035.9
National Institute of Standards and Technology.....	100.5	100.8	98.6	107.9	115.5	122.3	140.0	179.0	207.2	253.2	563.3	516.5	481.7	486.9
National Oceanic and Atmospheric Administration.....	269.8	274.7	286.1	263.0	268.6	300.1	338.0	462.4	439.5	562.6	560.9	528.5	543.7	524.7
Other.....	28.4	23.7	17.5	18.0	13.7	15.7	11.6	9.8	9.6	10.3	11.8	22.5	19.5	24.3
Department of Defense, total.....	29,791.5	32,937.9	35,231.5	35,248.9	37,576.9	37,268.1	32,134.8	36,129.5	35,849.1	34,574.8	34,345.9	34,494.9	34,918.2	34,030.4
Department of the Army.....	4,570.8	4,809.4	5,019.5	4,806.0	5,659.3	5,684.1	6,081.5	6,854.2	6,209.1	5,574.1	5,419.3	4,873.6	4,929.3	4,580.4
Department of the Navy.....	9,127.4	9,650.3	9,507.8	9,514.1	9,666.1	9,586.2	7,806.0	8,030.8	9,102.9	8,929.0	8,963.3	8,606.4	8,184.6	7,824.5
Department of the Air Force.....	13,260.9	13,593.8	15,347.7	14,867.3	15,237.4	14,831.4	10,937.5	13,427.1	12,635.3	12,527.4	11,797.9	13,042.1	13,917.4	14,412.9
Defense Agencies	2,781.7	4,767.4	5,219.7	5,832.9	6,858.9	6,945.2	7,072.5	7,571.7	7,647.0	7,301.3	7,912.8	7,693.3	7,623.4	6,919.5
Operational Test and Evaluation, Director.....		0.0	8.4	68.2	14.4	32.6	13.6	12.4	12.3	11.2	21.7	21.9	25.0	23.5
Test & Evaluation, Deputy Under Secretary Defense.....	50.6	117.1	128.5	160.3	140.7	188.7	223.7	233.2	242.5	231.8	231.0	257.7	238.4	269.7
Department of Education, total.....	124.9	121.3	132.5	140.7	159.1	169.9	171.0	168.5	177.7	176.6	177.6	173.7	190.1	225.5
Department of Energy, total.....	4,966.0	4,688.3	4,757.2	5,036.4	5,192.6	5,630.6	5,983.1	6,172.2	6,262.1	6,048.0	6,145.0	5,344.9	5,687.2	5,636.3
Department of Health & Human Services, total.....	5,451.0	5,657.6	6,606.3	7,158.0	7,902.8	8,405.6	9,756.0	8,987.8	10,349.2	11,021.5	11,455.2	11,953.1	12,763.7	13,127.4
Centers for Disease Control.....	47.6	52.2	66.2	88.7	117.8	95.6	113.4	146.9	162.5	206.8	317.4	296.7	345.7	358.5
Food and Drug Administration.....	82.1	79.4	85.0	91.0	99.0	99.0	125.0	135.7	154.5	169.4	170.5	170.8	170.3	181.6
National Institutes of Health 1/.....	5,205.3	5,401.2	6,326.4	6,845.7	7,473.9	7,979.2	9,156.1	8,409.2	9,765.1	10,329.4	10,681.8	11,251.0	11,983.3	12,318.5
Other.....	116.0	124.8	128.7	132.6	212.1	231.9	361.5	296.0	267.1	315.9	285.6	234.6	264.3	268.7
Department of Housing and Urban Development, total.....	18.5	15.3	16.3	18.4	18.0	19.3	27.8	25.1	23.6	39.6	41.8	33.1	36.2	39.5
Department of Interior, total.....	391.7	385.2	403.8	416.8	469.0	508.5	592.9	609.2	619.1	694.1	561.6	567.5	576.2	595.6
Bureau of Mines 2/.....	89.9	84.4	88.8	91.3	98.7	99.3	106.1	107.1	111.9	107.9	0.0			
Geological Survey.....	214.9	218.6	226.8	236.1	279.9	308.4	356.6	361.4	356.7	371.1	362.0	518.9	524.0	539.0
U.S. Fish & Wildlife Service 3/.....	49.0	47.0	53.3	59.2	60.6	69.4	81.0	85.1	86.5	0.0	0.0	0.0	0.0	0.0
Other.....	37.9	35.2	34.9	30.2	29.8	31.4	49.2	55.6	64.0	215.1	199.6	48.6	52.2	56.6

See explanatory information and SOURCE at end of table.

Table B-12. Federal obligations for research and development, by agency: fiscal years 1985–98

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Page 2 of 2

Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Preliminary	
													1997	1998
	[Millions of current dollars]													
Department of Justice, total.....	36.0	36.5	42.4	43.1	38.2	40.5	48.9	48.0	48.9	45.0	57.9	77.3	89.5	85.2
Department of Labor, total.....	13.3	10.4	21.6	35.6	35.4	73.0	44.0	51.7	55.0	59.7	55.4	52.4	40.6	38.0
Department of State, total.....	1.5	1.5	3.0	4.2	4.7	4.7	5.9	5.6	5.3	0.4	0.5	0.9	0.8	0.8
Department of Transportation, total.....	428.9	385.5	325.0	304.6	303.3	366.6	379.9	445.0	545.3	620.7	727.0	552.5	651.2	666.1
Federal Aviation Administration.....	286.3	260.6	167.3	160.5	146.8	216.1	220.1	236.2	248.9	285.6	288.4	208.3	245.6	228.7
Federal Highway Administration.....	49.0	45.5	76.7	74.1	91.0	91.5	86.9	130.2	174.9	235.7	312.5	240.0	288.9	326.9
Federal Railroad Administration.....	15.0	15.4	11.2	10.0	9.0	10.2	15.9	22.7	25.2	19.5	26.5	26.7	19.7	20.8
National Highway Traffic Safety Administration.....	28.1	22.4	27.9	28.3	29.7	16.9	21.4	25.8	31.6	25.3	39.7	33.2	36.5	42.0
Other.....	50.5	41.6	41.9	31.7	26.9	31.9	35.6	30.1	64.8	54.7	59.8	44.3	60.5	47.7
Department of Treasury, total.....	24.3	24.0	26.9	26.1	25.6	25.6	30.8	24.6	16.6	19.0	61.4	60.0	58.6	52.9
Department of Veterans Affairs, total.....	226.6	186.2	209.5	215.3	234.7	237.7	216.6	223.9	236.2	248.0	237.9	256.1	276.0	240.3
Agency for International Development.....	220.4	251.2	217.5	204.4	279.1	334.6	377.7	365.9	382.2	254.3	302.5	223.0	169.0	225.0
Environmental Protection Agency.....	320.4	317.3	348.2	347.4	380.3	419.7	432.6	483.9	495.3	553.5	551.5	464.3	504.0	553.9
National Aeronautics and Space Administration.....	3,327.2	3,419.8	3,787.1	4,330.4	5,393.5	6,533.2	7,280.2	7,657.6	8,019.9	8,296.2	9,014.9	8,570.1	8,993.6	9,272.0
National Science Foundation.....	1,345.6	1,353.3	1,470.5	1,532.8	1,670.4	1,689.5	1,785.2	1,868.4	1,881.9	2,040.4	2,149.3	2,188.3	2,257.5	2,346.9
Nuclear Regulatory Commission.....	150.0	123.8	122.5	108.5	114.8	108.8	108.8	119.0	119.8	90.7	88.2	70.9	57.0	53.9
Smithsonian Institution.....	71.1	63.3	71.5	75.1	80.2	84.0	98.0	98.0	102.0	124.2	124.0	127.0	129.0	132.0
Tennessee Valley Authority.....	79.5	77.5	77.9	87.3	62.6	64.9	68.3	97.3	108.6	97.9	93.1	52.6	62.7	44.0
All other agencies 4/.....	29.6	28.8	32.5	30.0	29.1	28.1	26.2	33.0	32.3	26.5	29.4	30.5	60.2	60.7

1/ Includes research and development activities of the Alcohol, Drug Abuse, and Mental Health Administration, which existed as a separate agency prior to October 1992, before its R&D functions became associated with NIH.

2/ The Bureau of Mines was discontinued after 1994.

3/ As of Fiscal Year 1994, the National Biological Service performs all biological research activities formerly funded by the U.S. Fish & Wildlife Service and the National Park Service.

4/ As of March 31, 1995, the Social Security Administration became an independent agency, and no longer part of the Department of Health and Human Services.

NOTE: Because of rounding, detail may not add to totals.

SOURCE: National Science Foundation/Division of Science Resources Studies, Federal Funds Survey, *Federal Funds for Research and Development: Detailed Historical Tables, Fiscal Years 1951–98*.

Table B-13. Federal obligations for basic research, by agency: fiscal years 1985-98

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Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Preliminary	
													1997	1998
	[Millions of current dollars]													
Total, all agencies.....	7,818.7	8,153.1	8,942.4	9,473.6	10,602.0	11,285.6	12,170.8	12,489.9	13,399.1	13,545.1	13,892.8	14,462.4	14,958.7	15,204.7
Department of Agriculture, total.....	445.4	432.9	445.5	480.6	484.9	519.2	557.6	595.2	615.9	606.3	595.0	550.0	600.2	593.5
Agricultural Research Service.....	250.2	247.7	253.4	271.1	282.7	294.0	309.7	326.1	341.0	366.5	369.0	364.6	364.2	369.3
Cooperative State Research Service.....	141.5	131.7	132.8	145.8	142.6	153.7	170.4	189.6	192.5	194.7	186.0	148.7	198.8	186.8
Forest Service.....	44.1	42.2	49.4	51.6	50.0	60.3	66.6	68.9	69.4	33.3	32.9	29.3	29.7	29.7
Other.....	9.5	11.3	9.9	12.0	9.6	11.1	10.9	10.6	13.0	11.9	7.2	7.4	7.5	7.7
Department of Commerce, total.....	23.2	26.5	25.8	30.9	29.1	31.4	34.3	34.5	37.2	40.1	39.3	37.5	41.2	40.7
National Institute of Standards and Technology.....	22.1	25.7	25.1	26.3	27.9	28.6	31.9	33.6	36.5	39.8	38.9	36.7	40.2	39.7
National Oceanic and Atmospheric Administration.....	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Other.....	1.2	0.8	0.7	1.3	1.2	2.8	2.4	0.9	0.4	0.3	0.3	0.9	1.0	1.0
Department of Defense, total.....	861.4	923.9	907.6	876.9	947.9	947.6	994.2	1,098.9	1,268.2	1,222.3	1,264.1	1,137.9	1,029.4	1,116.7
Department of the Army.....	240.8	248.5	217.0	165.7	187.2	185.1	188.6	204.9	215.7	213.3	218.8	195.1	175.4	203.0
Department of the Navy.....	343.1	337.3	354.3	341.8	354.0	365.0	388.0	393.8	422.0	400.1	409.4	376.7	338.3	380.3
Department of the Air Force.....	198.3	216.5	221.6	196.4	202.8	197.0	209.2	205.8	218.7	242.4	206.8	227.9	211.3	225.4
Defense Agencies	79.2	121.7	114.8	173.0	203.9	200.5	208.3	294.4	411.8	366.5	429.1	338.2	304.5	307.9
Operational Test and Evaluation, Director.....		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Test & Evaluation, Deputy Under Secretary Defense.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Department of Education, total.....	14.6	4.5	3.1	4.4	4.4	4.9	8.6	7.5	5.3	5.5	5.5	3.5	3.1	5.3
Department of Energy, total.....	942.6	959.7	1,068.5	1,184.8	1,410.9	1,504.8	1,686.5	1,736.4	1,754.8	1,603.2	1,634.4	1,929.7	2,004.0	2,095.5
Department of Health & Human Services, total.....	3,232.5	3,338.8	3,827.9	4,081.4	4,388.0	4,649.0	5,050.1	5,058.7	5,696.7	5,884.0	6,061.1	6,504.6	6,940.1	7,004.5
Centers for Disease Control.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food and Drug Administration.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
National Institutes of Health 1/.....	3,214.8	3,322.0	3,807.7	4,060.9	4,361.3	4,647.9	5,048.6	5,057.4	5,695.6	5,882.4	6,060.0	6,503.6	6,939.1	7,004.5
Other.....	17.8	16.8	20.2	20.5	26.7	1.2	1.5	1.3	1.1	1.6	1.0	1.0	1.0	0.0
Department of Housing and Urban Development, total.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Department of Interior, total.....	138.3	133.0	134.9	126.5	188.9	205.4	229.3	230.9	230.3	83.2	55.2	56.0	56.4	64.8
Bureau of Mines 2/.....	49.9	44.9	45.6	32.1	43.9	40.6	42.8	43.7	44.6	25.4	0.0			
Geological Survey.....	80.5	83.4	84.9	89.5	140.2	159.1	179.1	180.1	178.0	43.5	41.6	55.5	55.9	64.3
U.S. Fish & Wildlife Service 3/.....	5.7	3.6	4.3	4.8	4.8	5.6	6.2	6.4	6.4	0.0	0.0	0.0	0.0	0.0
Other.....	2.2	1.1	0.1	0.1	0.0	0.1	1.2	0.7	1.3	14.3	13.6	0.5	0.5	0.5

See explanatory information and SOURCE at end of table.

Table B-13. Federal obligations for basic research, by agency: fiscal years 1985-98

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Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Preliminary	
													1997	1998
	[Millions of current dollars]													
Department of Justice, total.....	4.2	5.3	8.1	7.6	6.8	8.8	6.4	5.3	5.0	5.9	8.1	12.6	11.6	23.6
Department of Labor, total.....	3.3	0.9	1.4	0.4	0.3	0.3	0.3	0.2	5.6	5.8	13.3	11.5	11.3	11.1
Department of State, total.....	0.0	0.0	2.6	3.1	3.4	3.5	4.6	4.9	4.8	0.0	0.0	0.0	0.0	0.0
Department of Transportation, total.....	1.1	0.6	0.2	0.0	0.0	0.0	0.0	1.2	1.7	3.0	46.9	41.3	33.5	40.1
Federal Aviation Administration.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Federal Highway Administration.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	1.7	3.0	46.9	38.4	30.8	35.8
Federal Railroad Administration.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
National Highway Traffic Safety Administration.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other.....	1.1	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	2.7	4.3
Department of Treasury, total.....	4.8	5.1	4.7	4.8	3.4	3.4	3.6	3.6	6.5	0.0	0.0	0.0	0.0	0.0
Department of Veterans Affairs, total.....	15.4	14.8	17.2	17.3	16.6	16.2	16.1	15.7	13.3	14.4	12.4	12.5	13.5	11.7
Agency for International Development.....	1.7	4.3	2.8	3.0	3.1	5.0	5.7	5.8	8.4	1.8	2.3	2.0	4.0	6.0
Environmental Protection Agency.....	38.6	38.5	31.1	27.2	50.7	73.6	91.2	110.4	89.1	101.4	70.3	51.7	52.8	53.9
National Aeronautics and Space Administration.....	750.9	916.7	1,013.7	1,112.7	1,417.4	1,636.9	1,705.6	1,738.2	1,800.1	1,963.9	1,978.2	1,980.9	1,959.3	1,857.7
National Science Foundation.....	1,261.8	1,275.2	1,371.2	1,433.2	1,562.6	1,586.3	1,676.2	1,741.5	1,743.8	1,870.7	1,973.3	2,002.9	2,067.9	2,146.9
Nuclear Regulatory Commission.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smithsonian Institution.....	71.1	63.3	71.5	75.1	80.2	84.0	98.0	98.0	102.0	124.2	124.0	127.0	129.0	132.0
Tennessee Valley Authority.....	5.5	7.3	3.9	3.2	2.9	4.7	1.9	2.1	9.9	8.9	9.0	0.3	0.9	0.2
All other agencies 4/.....	2.3	2.0	0.9	0.6	0.4	0.5	0.7	0.8	0.5	0.6	0.5	0.5	0.5	0.5

1/ Includes research and development activities of the Alcohol, Drug Abuse, and Mental Health Administration, which existed as a separate agency prior to October 1992, before its R&D functions became associated with NIH.

2/ The Bureau of Mines was discontinued after 1994.

3/ As of Fiscal Year 1994, the National Biological Service performs all biological research activities formerly funded by the U.S. Fish & Wildlife Service and the National Park Service.

4/ As of March 31, 1995, the Social Security Administration became an independent agency, and no longer part of the Department of Health and Human Services.

NOTE: Because of rounding, detail may not add to totals.

SOURCE: National Science Foundation/Division of Science Resources Studies, Federal Funds Survey, *Federal Funds for Research and Development: Detailed Historical Tables, Fiscal Years 1951-98*.

Table B-14. Federal obligations for applied research, by agency: fiscal years 1985-98

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Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Preliminary	
													1997	1998
	[Millions of current dollars]													
Total, all agencies.....	8,314.7	8,349.1	8,998.1	9,176.5	10,163.5	10,336.8	11,797.6	12,000.7	13,491.4	13,887.7	14,677.1	13,802.7	14,526.5	15,013.9
Department of Agriculture, total.....	465.6	463.5	473.4	504.6	517.3	542.1	617.9	665.8	635.8	716.2	703.8	671.7	717.5	693.4
Agricultural Research Service.....	191.8	188.3	201.1	208.2	209.4	218.2	241.1	257.1	233.3	257.9	259.6	256.6	261.1	264.8
Cooperative State Research Service.....	142.8	137.4	138.0	152.6	164.7	170.5	206.4	228.6	226.2	234.3	231.7	213.7	250.1	219.6
Forest Service.....	65.7	67.5	73.5	79.9	77.5	93.5	103.6	106.9	107.8	156.5	154.8	143.0	144.8	144.8
Other.....	65.2	70.3	60.8	63.9	65.7	59.9	66.8	73.2	68.5	67.5	57.6	58.4	61.5	64.2
Department of Commerce, total.....	301.0	312.9	312.8	311.5	321.9	345.6	415.4	561.4	544.9	678.2	853.1	813.1	812.7	812.8
National Institute of Standards and Technology.....	64.5	63.5	64.3	72.6	77.6	83.2	92.5	115.8	136.4	167.5	333.1	318.2	302.9	304.6
National Oceanic and Atmospheric Administration.....	224.4	237.5	234.4	225.0	234.6	252.4	315.6	438.7	401.4	502.7	510.4	480.8	496.4	491.7
Other.....	12.1	12.0	14.1	13.9	9.7	10.0	7.3	6.9	7.1	8.0	9.6	14.1	13.4	16.4
Department of Defense, total.....	2,306.9	2,303.3	2,440.0	2,362.2	2,708.2	2,581.6	2,723.8	2,974.5	3,515.2	3,040.0	3,069.8	2,857.6	2,867.9	2,791.1
Department of the Army.....	582.6	578.8	692.9	588.0	636.3	595.2	671.9	727.8	802.8	639.3	633.3	475.3	551.9	502.2
Department of the Navy.....	448.2	447.1	432.5	406.0	429.2	442.6	486.0	499.0	574.1	447.0	470.5	516.8	574.6	492.9
Department of the Air Force.....	538.4	542.5	563.2	576.7	604.6	579.3	621.2	584.7	669.1	571.9	627.7	654.4	651.5	598.8
Defense Agencies	737.7	735.0	751.3	791.5	1,038.1	964.6	944.7	1,162.9	1,469.2	1,381.7	1,338.3	1,211.1	1,090.0	1,197.2
Operational Test and Evaluation, Director.....		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Test & Evaluation, Deputy Under Secretary Defense.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Department of Education, total.....	77.3	91.3	103.8	106.6	117.5	125.3	123.1	119.5	128.3	131.2	132.8	132.1	143.9	163.9
Department of Energy, total.....	1,198.4	1,080.7	1,029.4	1,050.6	1,020.8	1,065.7	1,587.2	1,676.1	1,685.4	1,679.2	1,825.6	1,432.5	1,494.0	1,580.6
Department of Health & Human Services, total.....	1,795.8	1,850.8	2,194.0	2,415.6	2,700.4	2,818.1	3,112.4	2,886.8	3,495.9	3,852.5	4,014.9	4,041.3	4,335.8	4,535.9
Centers for Disease Control.....	47.6	52.2	66.2	88.7	117.8	95.6	113.4	146.9	162.5	206.8	317.4	296.7	345.7	358.5
Food and Drug Administration.....	82.1	79.4	85.0	91.0	99.0	99.0	125.0	135.7	154.5	169.4	170.5	170.8	170.3	181.6
National Institutes of Health 1/.....	1,589.8	1,660.5	1,980.3	2,172.2	2,393.1	2,489.1	2,657.4	2,341.3	2,942.9	3,197.4	3,273.6	3,373.3	3,591.3	3,761.8
Other.....	76.3	58.7	62.6	63.6	90.5	134.3	216.6	262.9	236.0	278.9	253.5	200.5	228.4	233.9
Department of Housing and Urban Development, total.....	6.5	5.3	5.5	6.3	6.1	6.6	9.4	8.8	8.1	13.7	14.2	11.2	12.8	14.1
Department of Interior, total.....	231.0	234.9	247.3	266.0	253.0	269.8	324.1	339.7	349.8	566.9	477.3	486.0	492.4	502.7
Bureau of Mines 2/.....	36.7	36.6	39.6	54.1	49.3	49.3	56.2	59.2	60.4	70.0	0.0			
Geological Survey.....	130.0	127.8	131.7	135.8	126.8	134.2	159.3	164.3	165.9	311.9	306.2	439.5	442.5	448.5
U.S. Fish & Wildlife Service 3/.....	32.2	38.1	43.3	48.7	49.1	56.4	64.8	64.8	64.8	0.0	0.0	0.0	0.0	0.0
Other.....	32.1	32.4	32.7	27.4	27.8	29.9	43.8	51.4	58.7	185.0	171.1	46.5	49.9	54.2

See explanatory information and SOURCE at end of table.

Table B-14. Federal obligations for applied research, by agency: fiscal years 1985-98

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Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Preliminary	
													1997	1998
	[Millions of current dollars]													
Department of Justice, total.....	15.1	17.0	11.8	9.8	10.7	11.1	14.7	15.0	20.5	20.0	17.7	19.5	23.0	18.0
Department of Labor, total.....	9.1	8.7	19.0	26.4	21.8	21.3	24.0	23.6	13.4	13.7	16.6	15.2	10.8	10.9
Department of State, total.....	1.5	1.5	0.3	1.0	1.3	1.2	1.3	0.7	0.5	0.4	0.5	0.9	0.8	0.8
Department of Transportation, total.....	70.2	67.6	68.6	91.2	120.5	119.2	114.6	155.7	224.4	270.4	323.9	336.7	412.0	407.9
Federal Aviation Administration.....	17.3	14.0	11.1	13.3	23.6	26.1	24.0	30.1	59.8	79.5	83.3	130.6	163.5	131.0
Federal Highway Administration.....	6.3	14.7	20.7	43.7	56.6	57.6	46.1	72.0	90.1	131.2	156.3	135.4	170.6	189.1
Federal Railroad Administration.....	11.4	12.5	10.4	8.2	7.5	8.5	13.2	18.9	20.9	16.1	22.5	21.3	19.0	20.1
National Highway Traffic Safety Administration.....	20.9	16.1	18.9	19.1	26.2	16.9	21.4	25.8	31.6	25.3	39.7	33.2	36.5	42.0
Other.....	14.3	10.3	7.5	7.0	6.6	10.0	10.0	8.9	22.1	18.4	22.1	16.2	22.3	25.6
Department of Treasury, total.....	13.6	12.7	12.7	11.1	13.0	15.3	20.6	17.2	4.6	9.2	48.9	50.4	48.2	41.1
Department of Veterans Affairs, total.....	193.7	155.1	173.1	178.8	197.1	199.4	177.7	185.2	194.1	209.1	206.4	222.8	240.1	209.1
Agency for International Development.....	158.1	180.7	151.2	132.1	216.0	300.2	351.7	294.2	350.8	214.4	270.4	203.0	152.0	202.0
Environmental Protection Agency.....	176.0	179.3	246.1	240.7	222.6	241.6	261.9	293.9	272.4	301.0	331.3	329.1	362.0	403.2
National Aeronautics and Space Administration.....	1,032.7	1,152.3	1,255.5	1,218.9	1,461.4	1,423.8	1,665.6	1,491.1	1,748.6	1,876.7	2,067.9	1,897.1	2,094.5	2,319.0
National Science Foundation.....	83.8	78.1	99.3	99.6	107.8	103.3	109.0	126.9	138.1	169.7	176.0	185.4	189.6	200.1
Nuclear Regulatory Commission.....	150.0	123.8	122.5	108.5	114.8	108.8	108.8	119.0	119.8	90.7	88.2	70.9	57.0	53.9
Smithsonian Institution.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tennessee Valley Authority.....	8.9	10.5	13.8	15.3	11.7	17.0	16.9	22.2	18.1	17.0	17.4	4.8	7.6	2.7
All other agencies 4/.....	19.8	19.1	18.0	19.9	19.6	19.9	17.6	23.2	22.6	17.6	20.4	21.5	51.9	50.8

1/ Includes research and development activities of the Alcohol, Drug Abuse, and Mental Health Administration, which existed as a separate agency prior to October 1992, before its R&D functions became associated with NIH.

2/ The Bureau of Mines was discontinued after 1994.

3/ As of Fiscal Year 1994, the National Biological Service performs all biological research activities formerly funded by the U.S. Fish & Wildlife Service and the National Park Service.

4/ As of March 31, 1995, the Social Security Administration became an independent agency, and no longer part of the Department of Health and Human Services.

NOTE: Because of rounding, detail may not add to totals.

SOURCE: National Science Foundation/Division of Science Resources Studies, Federal Funds Survey, *Federal Funds for Research and Development: Detailed Historical Tables, Fiscal Years 1951-98*.

Table B-15. Federal obligations for development, by agency: fiscal years 1985–98

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Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Preliminary	
													1997	1998
	[Millions of current dollars]													
Total, all agencies.....	32,226.1	34,910.2	37,313.2	38,119.3	40,641.0	41,937.1	37,326.8	41,102.0	40,423.5	39,824.2	40,166.5	39,397.5	40,487.7	39,619.8
Department of Agriculture, total.....	32.0	32.1	29.0	31.4	36.1	47.1	61.2	66.1	76.1	77.4	81.4	80.3	89.1	89.1
Agricultural Research Service.....	27.7	27.4	24.0	26.3	31.4	33.3	40.2	43.9	52.8	54.3	54.7	54.0	61.8	62.7
Cooperative State Research Service.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forest Service.....	3.3	3.6	3.8	4.0	3.9	4.8	4.5	4.9	5.5	3.3	5.8	5.6	5.3	5.3
Other.....	1.0	1.1	1.1	1.1	0.7	9.0	16.5	17.3	17.7	19.8	20.9	20.7	22.0	21.1
Department of Commerce, total.....	74.6	59.7	63.7	46.6	46.9	61.2	39.9	55.3	74.2	107.8	243.7	216.9	190.9	182.3
National Institute of Standards and Technology.....	14.0	11.6	9.3	9.1	10.0	10.5	15.6	29.6	34.3	45.9	191.2	161.6	138.6	142.6
National Oceanic and Atmospheric Administration.....	45.4	37.2	51.7	34.8	34.1	47.7	22.4	23.7	37.8	59.9	50.6	47.7	47.3	33.0
Other.....	15.2	10.9	2.7	2.8	2.8	2.9	1.9	2.0	2.1	2.0	1.9	7.6	5.1	6.8
Department of Defense, total.....	26,623.2	29,710.7	31,884.0	32,009.7	33,920.8	33,738.9	28,416.9	32,056.1	31,065.7	30,312.6	30,012.0	30,499.4	31,020.8	30,122.7
Department of the Army.....	3,747.4	3,982.1	4,109.6	4,052.3	4,835.9	4,903.8	5,221.0	5,921.5	5,190.5	4,721.5	4,567.2	4,203.2	4,202.1	3,875.2
Department of the Navy.....	8,336.1	8,865.9	8,721.1	8,766.2	8,882.9	8,778.6	6,932.0	7,138.0	8,106.8	8,081.9	8,083.3	7,712.9	7,271.7	6,951.3
Department of the Air Force.....	12,524.3	12,834.8	14,562.9	14,094.2	14,430.0	14,055.1	10,107.1	12,636.6	11,747.5	11,713.1	10,963.4	12,159.8	13,054.7	13,588.7
Defense Agencies	1,964.8	3,910.7	4,353.5	4,868.4	5,616.8	5,780.2	5,919.4	6,114.4	5,766.0	5,553.1	6,145.3	6,144.0	6,228.9	5,414.3
Operational Test and Evaluation, Director.....		0.0	8.4	68.2	14.4	32.6	13.6	12.4	12.3	11.2	21.7	21.9	25.0	23.5
Test & Evaluation, Deputy Under Secretary Defense.....	50.6	117.1	128.5	160.3	140.7	188.7	223.7	233.2	242.5	231.8	231.0	257.7	238.4	269.7
Department of Education, total.....	33.0	25.5	25.6	29.7	37.2	39.7	39.4	41.5	44.1	39.9	39.3	38.2	43.0	56.3
Department of Energy, total.....	2,825.0	2,648.0	2,659.4	2,801.0	2,760.9	3,060.1	2,709.5	2,759.7	2,821.9	2,765.5	2,685.0	1,982.8	2,189.1	1,960.2
Department of Health &														
Human Services, total.....	422.7	468.0	584.3	661.1	814.4	938.5	1,593.5	1,042.3	1,156.6	1,285.1	1,379.3	1,407.2	1,487.8	1,587.0
Centers for Disease Control.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Food and Drug Administration.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
National Institutes of Health 1/.	400.8	418.7	538.4	612.6	719.5	842.2	1,450.1	1,010.5	1,126.6	1,249.6	1,348.2	1,374.1	1,452.9	1,552.3
Other.....	22.0	49.3	45.9	48.4	94.9	96.4	143.4	31.8	30.0	35.4	31.1	33.2	34.9	34.8
Department of Housing and Urban Development, total.....	12.0	10.1	10.8	12.1	11.9	12.7	18.4	16.3	15.5	25.9	27.7	22.0	23.4	25.4
Department of Interior, total.....	22.4	17.3	21.7	24.3	27.1	33.3	39.5	38.6	39.0	43.9	29.2	25.5	27.5	28.0
Bureau of Mines 2/.	3.3	2.8	3.6	5.2	5.4	9.4	7.1	4.2	6.9	12.5	0.0			
Geological Survey.....	4.4	7.4	10.3	10.9	12.9	15.1	18.2	16.9	12.8	15.7	14.1	23.8	25.5	26.1
U.S. Fish & Wildlife Service 3/.	11.1	5.3	5.7	5.7	6.7	7.4	10.0	13.9	15.3	0.0	0.0	0.0	0.0	0.0
Other.....	3.6	1.8	2.1	2.5	2.1	1.4	4.2	3.6	4.0	15.7	15.1	1.7	2.0	1.9

See explanatory information and SOURCE at end of table.

Table B-15. Federal obligations for development, by agency: fiscal years 1985–98

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Agency and subdivision	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	Preliminary	
													1997	1998
	[Millions of current dollars]													
Department of Justice, total.....	16.7	14.1	22.5	25.7	20.6	20.6	27.8	27.7	23.3	19.2	32.1	45.2	55.0	43.6
Department of Labor, total.....	0.9	0.9	1.2	8.9	13.3	51.4	19.7	27.9	36.1	40.1	25.5	25.8	18.6	16.0
Department of State, total.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Department of Transportation, total.....	357.6	317.3	256.2	213.4	182.9	247.4	265.3	288.1	319.3	347.4	356.2	174.5	205.7	218.1
Federal Aviation Administration.....	269.0	246.6	156.2	147.3	123.2	189.9	196.2	206.1	189.1	206.1	205.1	77.7	82.1	97.7
Federal Highway Administration.....	42.6	30.8	56.0	30.4	34.4	33.8	40.8	57.0	83.1	101.5	109.4	66.1	87.5	102.0
Federal Railroad Administration.....	3.6	2.9	0.8	1.8	1.5	1.7	2.7	3.9	4.3	3.4	4.0	5.4	0.7	0.7
National Highway Traffic Safety Administration.....	7.2	6.3	9.0	9.2	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other.....	35.2	30.6	34.3	24.7	20.3	21.9	25.6	21.2	42.7	36.3	37.8	25.3	35.4	17.8
Department of Treasury, total.....	6.0	6.3	9.5	10.2	9.3	6.9	6.7	3.8	5.5	9.8	12.4	9.5	10.5	11.8
Department of Veterans Affairs, total.....	17.5	16.3	19.2	19.2	21.0	22.1	22.8	23.0	28.7	24.5	19.1	20.8	22.4	19.5
Agency for International Development.....	60.5	66.2	63.5	69.3	60.0	29.3	20.4	65.9	23.0	38.1	29.8	18.0	13.0	17.0
Environmental Protection Agency.....	105.8	99.5	71.0	79.5	107.0	104.5	79.5	79.6	133.7	151.2	149.9	83.5	89.2	96.8
National Aeronautics and Space Administration.....	1,543.6	1,350.8	1,517.8	1,998.8	2,514.7	3,472.6	3,909.1	4,428.3	4,471.1	4,455.7	4,968.9	4,692.1	4,939.8	5,095.3
National Science Foundation.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nuclear Regulatory Commission.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Smithsonian Institution.....	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tennessee Valley Authority.....	65.1	59.8	60.2	68.8	48.0	43.2	49.5	72.9	80.6	71.9	66.7	47.4	54.2	41.2
All other agencies 4/.....	7.5	7.7	13.7	9.5	9.0	7.8	7.9	8.9	9.1	8.3	8.4	8.4	7.9	9.4

1/ Includes research and development activities of the Alcohol, Drug Abuse, and Mental Health Administration, which existed as a separate agency prior to October 1992, before its R&D functions became associated with NIH.

2/ The Bureau of Mines was discontinued after 1994.

3/ As of Fiscal Year 1994, the National Biological Service performs all biological research activities formerly funded by the U.S. Fish & Wildlife Service and the National Park Service.

4/ As of March 31, 1995, the Social Security Administration became an independent agency, and no longer part of the Department of Health and Human Services.

NOTE: Because of rounding, detail may not add to totals.

SOURCE: National Science Foundation/Division of Science Resources Studies, Federal Funds Survey, *Federal Funds for Research and Development: Detailed Historical Tables, Fiscal Years 1951–98*.

Table B-16. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Total for all industries	Manufacturing															
		Total manu- facturing	Food, kindred, and tobacco products (20,21)	Textiles and apparel (22,23)	Lumber, wood products, and furniture (24,25)	Paper and allied products (26)	Chemicals and allied products				Petroleum refining and extraction (13,29)	Rubber products (30)	Stone, clay, and glass products (32)	Primary metals			Fabricated metal products (34)
							Total (28)	Industrial chemicals (281–82, 286)	Drugs and medicines (283)	Other chemicals (284–85, 287–89)				Total (33)	Ferrous metals and products (331–32, 3398–99)	Nonferrous metals and products (333–36)	
Year	[Millions of current dollars]																
1986.....	87,823	80,377	D	D	144	D	8,843	3,552	3,658	1,633	D	D	950	D	D	458	895
1987.....	92,155	84,311	1,206	D	137	D	9,635	3,716	D	D	1,897	D	995	730	D	D	783
1988.....	97,015	86,503	D	D	D	D	11,067	4,172	4,906	1,989	1,997	D	D	637	253	384	881
1989.....	102,055	88,024	D	D	192	879	12,069	4,451	D	D	2,180	D	D	686	D	D	904
1990.....	109,727	88,934	D	D	216	1,059	13,291	5,010	D	D	2,306	D	D	739	D	D	939
1991.....	116,952	88,506	1,277	D	D	D	14,648	5,390	D	D	2,498	D	D	714	D	D	974
1992.....	119,110	90,177	1,386	D	D	D	15,381	5,165	7,944	2,272	2,277	D	D	522	D	D	1,017
1993.....	117,400	86,569	1,345	D	D	D	D	D	9,146	D	2,152	D	538	669	289	380	1,158
1994.....	119,595	90,749	1,476	D	D	D	D	D	9,633	D	1,950	D	591	690	D	D	1,111
1995.....	132,103	100,067	1,566	D	D	D	17,547	D	10,215	D	1,760	D	448	593	D	D	1,023
1996.....	144,667	111,864	1,564	D	D	D	D	D	9,773	2,505	1,654	D	468	D	D	D	D

See explanatory information and SOURCE at end of table.

Table B-16. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Manufacturing (continued)															Total nonmanu- facturing industries	
	Machinery			Electrical equipment					Transportation equipment				Professional and scientific instruments				Other manufac- turing industries (27,31,39)
	Total (35)	Office, computing, and accounting machines (357)	Other machinery, except electrical (351–56, 358–59)	Total (36)	Radio and TV receiving equipment (365)	Communi- cation equipment (366)	Electronic com- ponents (367)	Other electrical equipment (361–64, 369)	Total (37)	Motor vehicles and motor vehicles equipment (371)	Other transpor- tation equipment (373–75, 379)	Aircraft and missiles (372,376)	Total (38)	Scientific and mechan- ical measuring instruments (381–82)	Optical, surgical, photo- graphic, and other instru- ments (384–87)		
Year	[Millions of current dollars]																
1986.....	D	D	2,396	14,980	133	9,669	D	D	31,275	D	D	21,050	5,103	D	D	382	7,446
1987.....	D	D	2,428	15,848	139	10,184	4,286	1,239	34,246	D	D	24,458	5,222	D	D	D	7,844
1988.....	D	D	2,682	14,128	149	8,427	4,133	1,419	34,775	D	D	24,168	5,530	1,959	3,571	D	10,513
1989.....	D	D	2,729	13,318	96	7,071	4,025	2,126	33,859	D	D	22,331	5,992	2,366	3,626	D	14,031
1990.....	14,446	D	D	13,400	114	5,928	3,914	3,444	31,361	D	D	20,635	7,055	3,346	3,709	D	20,793
1991.....	14,775	D	D	13,415	D	4,787	D	D	27,428	D	D	16,629	8,705	D	D	D	28,446
1992.....	14,938	D	D	13,360	D	D	3,567	D	27,494	D	D	17,158	9,542	5,156	4,386	D	28,933
1993.....	8,381	4,950	3,431	13,349	D	D	5,311	D	27,258	11,718	483	15,056	10,119	5,681	4,438	D	30,831
1994.....	8,110	4,106	4,004	15,338	D	D	6,032	D	28,087	D	D	14,260	11,441	6,952	4,489	D	28,846
1995.....	D	D	5,041	18,751	D	D	D	D	32,441	D	D	16,951	11,976	7,146	4,831	D	32,036
1996.....	13,455	D	D	22,498	D	D	D	D	32,737	D	D	16,224	12,149	D	D	D	32,803

See explanatory information and SOURCE at end of table.

Table B-16. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Nonmanufacturing																				
	Transportation and utilities								Services												
	Total (40-42, 44-49)	Communications		Electric, gas, and sanitary services (49)	Other transport- ation and utilities (40-42, 44-47)	Trade (50-59)			Finance, insur- ance, and real estate (60-65, 67)	Total (701,72- 73, 75-81, 83-84, 87, 89)	Business services		Health services		Engineering and management services			Other engineer- ing and manage- ment services (872,874)	Other services (701,72, 75-79, 81,83- 84,89)	Other non- manu- facturing industries (07-12, 14-15, 161-162, 17)	
		Total (48)	Tele- phone (481)								Other (482- 484, 489)	Computer and data process- ing (737)	Other business services (731- 736, 738)	Total (80)	Doctors' offices and clinics, hospitals, and medical and dental labs (801, 806-807)	Other health services (802- 805, 808-809)	Total (87)				Engi- neering, architec- tural, and surveying (871)	Re- search, develop- ment, and testing (873)
Year	[Millions of current dollars]										[Millions of current dollars]										
1995.....	5,435	D	D	59	440	D	D	D	17,876	9,293	9,059	234	756	D	D	7,662	2,933	D	D	165	413
1996.....	4,678	D	D	73	352	D	6,389	D	19,022	10,641	D	D	D	715	D	7,318	1,660	5,484	173	D	D

See explanatory information and SOURCE at end of table.

Table B-16. Total (company, Federal, and other) funds for industrial R&D performance, by industry and size of company: 1986–96

Distribution by size of company	Total	Number of employees					
		Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Year	[Millions of current dollars]						
1986.....	87,823	7,071	1,902	7,472	4,251	10,493	56,991
1987.....	92,155	7,163	1,725	7,262	4,501	12,043	59,461
1988.....	97,015	S	1,669	7,622	5,245	11,506	63,694
1989.....	102,055	7,809	1,825	7,881	5,756	10,450	68,335
1990.....	109,727	S	2,154	8,411	6,746	12,486	71,030
1991.....	116,952	13,172	8,000	10,453	8,049	15,770	61,508
1992.....	119,110	13,557	7,958	11,886	8,258	15,744	61,707
1993.....	117,400	14,620	3,230	13,334	9,135	15,421	61,659
1994.....	119,595	13,966	3,608	14,617	8,912	15,972	62,519
1995.....	132,103	16,662	4,693	16,960	9,532	17,071	67,185
1996.....	144,667	20,249	4,637	18,273	11,537	20,164	69,808

KEY: D = Data withheld to avoid disclosing operations of individual companies.
S = Data prior to 1993 withheld because of imputation of more than 50 percent. (For subsequent imputations of more than 50 percent the numbers are provided in the table, and the imputations are mentioned in NOTES.)

NOTES: As a result of a new sample design, statistics for 1988–91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. Due to revisions in survey methodology, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" for 1996 are not comparable with statistics for prior years. More than 50 percent imputation was used for the 1996 value of "715" under the column "Doctor's offices and clinics, . . ."

SOURCE: National Science Foundation/Division of Science Resources Studies, *Research and Development in Industry 1995-96*.

Table B-17. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Total for all industries	Manufacturing															
		Total manu- facturing	Food, kindred, and tobacco products (20,21)	Textiles and apparel (22,23)	Lumber, wood products, and furniture (24,25)	Paper and allied products (26)	Chemicals and allied products				Petroleum refining and extraction (13,29)	Rubber products (30)	Stone, clay, and glass products (32)	Primary metals			Fabricated metal products (34)
							Total (28)	Industrial chemicals (281–82, 286)	Drugs and medicines (283)	Other chemicals (284–85, 287–89)				Total (33)	Ferrous metals and products (331–32, 3398–99)	Nonferrous metals and products (333–36)	
Year	[Millions of current dollars]																
1986.....	59,932	55,192	1,280	246	144	538	8,664	3,374	3,657	1,633	1,971	655	941	786	336	450	800
1987.....	61,403	56,259	1,204	243	137	604	9,445	3,531	4,095	1,819	1,883	596	985	711	249	462	633
1988.....	66,672	59,415	1,173	215	165	752	10,828	3,939	4,900	1,989	1,975	718	697	620	252	368	718
1989.....	73,501	63,199	1,244	S	192	879	11,943	4,340	5,512	2,091	2,162	867	615	666	244	422	726
1990.....	81,602	65,251	1,248	260	216	1,059	13,168	4,902	5,917	2,349	2,289	1,056	538	717	231	486	736
1991.....	90,580	67,639	1,277	236	200	1,174	14,439	5,225	6,947	2,267	2,487	D	455	706	225	481	748
1992.....	94,388	71,025	1,386	261	234	1,182	15,091	4,911	7,934	2,246	2,268	1,256	479	514	221	293	723
1993.....	94,591	69,901	1,345	286	196	1,191	16,658	5,165	9,132	2,361	2,138	1,059	529	646	272	374	936
1994.....	97,131	73,375	1,476	316	201	1,263	16,559	4,780	9,625	2,154	1,939	1,432	553	672	241	431	868
1995.....	108,652	81,236	1,566	381	229	1,404	17,337	5,139	10,202	1,996	1,754	1,210	441	580	217	363	937
1996.....	121,015	91,845	1,564	414	634	1,534	17,520	5,246	9,769	2,505	1,630	1,269	463	637	214	422	1,322

See explanatory information and SOURCE at end of table.

Table B-17. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Manufacturing (continued)																Total non- manu- facturing industries
	Machinery			Electrical equipment					Transportation equipment				Professional and scientific instruments			Other manufac- turing industries (27,31,39)	
	Total (35)	Office, computing, and accounting machines (357)	Other machinery, except electrical (351-56, 358-59)	Total (36)	Radio and TV receiving equipment (365)	Communi- cation equipment (366)	Electronic com- ponents (367)	Other electrical equipment (361-64, 369)	Total (37)	Motor vehicles and motor vehicles equipment (371)	Other transpor- tation equipment (373-75, 379)	Aircraft and missiles (372,376)	Total (38)	Scientific and mechan- ical measuring instruments (381-82)	Optical, surgical, photo- graphic, and other instru- ments (384-87)		
Year	[Millions of current dollars]																
1986.....	10,701	8,380	2,321	9,767	133	5,117	3,357	1,160	13,567	7,171	330	6,066	4,752	1,521	3,231	380	4,740
1987.....	10,577	8,193	2,384	10,449	139	5,455	3,630	1,225	13,462	7,167	356	5,939	4,950	1,598	3,352	380	5,144
1988.....	11,929	9,347	2,582	9,975	149	4,798	3,684	1,345	13,910	7,783	361	5,766	5,339	1,863	3,476	401	7,257
1989.....	13,342	10,725	2,618	9,575	96	4,159	3,655	1,664	14,596	8,756	337	5,503	5,729	2,205	3,524	438	10,302
1990.....	13,575	10,988	2,587	9,267	114	3,584	3,496	2,073	14,264	8,594	283	5,387	6,318	2,696	3,621	541	16,351
1991.....	13,720	10,419	3,301	8,865	D	S	3,177	D	14,858	9,063	262	5,533	6,840	3,017	3,823	D	22,941
1992.....	13,903	10,614	3,289	9,516	93	3,381	3,320	2,722	16,292	9,132	289	6,871	7,321	3,013	4,308	599	23,363
1993.....	8,295	4,917	3,378	11,682	87	3,954	5,105	2,537	16,640	10,659	297	5,684	7,542	3,196	4,346	758	24,690
1994.....	8,011	4,078	3,933	13,537	64	4,939	5,870	2,664	17,695	11,950	279	5,466	8,058	3,687	4,371	796	23,756
1995.....	9,676	4,699	4,976	17,060	114	3,845	9,628	3,473	19,311	13,590	232	5,489	8,516	3,787	4,729	835	27,415
1996.....	13,338	8,132	5,206	20,356	140	4,359	12,497	3,360	20,535	14,528	298	5,710	8,207	3,283	4,924	2,423	29,170

See explanatory information and SOURCE at end of table.

Table B-17. Company and other (except Federal) funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Nonmanufacturing																				
	Transportation and utilities						Trade (50–59)	Finance, insur- ance, and real estate (60–65, 67)	Services												
	Total (40–42, 44–49)	Communications			Electric, gas, and sanitary services (49)	Other transpor- tation and utilities (40–42, 44–47)			Total (701, 72–73, 75–81, 83–84, 87,89)	Business services			Health services		Engineering and management services			Other engineer- ing and man- agement services (872,874)	Other services (701,72, 75–79, 81,83– 84, 89)	Other non- manu- facturing industries (07–12, 14–15, 161–162, 17)	
		Total (48)	Tele- phone (481)	Other (482– 484, 489)						Total (73)	Com- puter and data process- ing (737)	Other business services (731– 736, 738)	Total (80)	Doctors' offices and clinics, hospitals, and medical and dental labs (801, 806–807)	Other health services (802– 805, 808–809)	Total (87)	Engi- neering, architec- tural, and surveying (871)				Re- search, develop- ment, and testing (873)
Year	[Millions of current dollars]										[Millions of current dollars]										
1995.....	5,183	4,756	4,697	59	347	80	7,514	710	13,606	8,681	8,545	136	753	737	16	4,011	1,050	2,829	132	160	402
1996.....	4,492	3,970	3,897	73	311	211	6,338	1,280	15,904	10,280	10,025	255	735	713	23	4,572	667	3,776	129	317	1,156

See explanatory information and SOURCE at end of table.

**Table B-17. Company and other (except Federal)
funds for industrial R&D performance, by
industry and size of company: 1986-96**

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Distribution by size of company	Total	Number of employees					
		Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Year	[Millions of current dollars]						
1986.....	59,932	6,203	1,765	6,243	3,455	8,489	33,777
1987.....	61,403	6,200	1,610	6,281	3,753	9,681	33,878
1988.....	66,672	S	1,748	6,820	4,075	10,512	36,785
1989.....	73,501	S	1,934	7,546	4,509	11,631	40,703
1990.....	81,602	S	2,144	8,363	4,997	12,890	45,106
1991.....	90,580	11,285	7,819	9,403	7,233	12,397	42,443
1992.....	94,388	11,532	7,807	10,865	7,495	12,328	44,361
1993.....	94,591	13,006	3,048	12,219	8,371	12,606	45,340
1994.....	97,131	12,802	3,426	13,533	8,087	13,625	45,658
1995.....	108,652	14,684	4,468	16,162	9,289	15,125	48,924
1996.....	121,015	17,948	4,418	17,761	11,068	19,133	50,686

KEY: D = Data withheld to avoid disclosing operations of individual companies.

S = Data prior to 1993 withheld because of imputation of more than 50 percent. (For subsequent imputations of more than 50 percent the numbers are provided in the table, and the imputations are mentioned in NOTES.)

NOTE: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. Due to revisions in survey methodology, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" for 1996 are not comparable with statistics for prior years. More than 50 percent imputation was used for the 1996 value of "735" under the column "Health Services, Total" and "713" under the column "Doctor's offices and clinics, . . ."

SOURCE: National Science Foundation/Division of Science Resources Studies, *Research and Development in Industry 1995-96*.

Table B-18. Federal funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Total for all industries	Manufacturing															
		Total manu- facturing	Food, kindred, and tobacco products (20,21)	Textiles and apparel (22,23)	Lumber, wood products, and furniture (24,25)	Paper and allied products (26)	Chemicals and allied products				Petroleum refining and extraction (13,29)	Rubber products (30)	Stone, clay, and glass products (32)	Primary metals			Fabricated metal products (34)
							Total (28)	Industrial chemicals (281–82, 286)	Drugs and medicines (283)	Other chemicals (284–85, 287–89)				Total (33)	Ferrous metals and products (331–32, 3398–99)	Nonferrous metals and products (333–36)	
Year	[Millions of current dollars]																
1986.....	27,891	25,185	D	D	0	D	179	178	1	0	D	D	9	D	D	8	95
1987.....	30,752	28,052	2	D	0	D	190	185	D	D	14	D	10	19	D	D	150
1988.....	30,343	27,088	D	D	D	D	238	232	6	0	22	D	D	17	1	16	163
1989.....	28,554	24,826	D	D	0	0	126	111	D	D	S	D	D	22	D	D	178
1990.....	28,125	23,683	D	D	0	0	123	109	D	D	S	D	D	D	D	D	203
1991.....	26,372	20,867	0	S	D	D	209	165	D	D	11	D	D	8	1	7	226
1992.....	24,722	19,152	0	D	D	D	S	S	S	S	9	D	D	S	D	D	294
1993.....	22,809	16,669	0	D	D	D	D	D	15	D	14	D	9	23	17	6	222
1994.....	22,463	17,373	0	D	D	D	D	D	8	D	10	D	38	17	D	D	243
1995.....	23,451	18,831	0	D	D	D	210	D	14	D	6	D	6	13	D	D	86
1996.....	23,653	20,020	0	D	D	D	D	D	3	0	24	D	5	D	D	D	D

See explanatory information and SOURCE at end of table.

Table B-18. Federal funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Manufacturing (continued)															Total non- manu- facturing industries	
	Machinery			Electrical equipment					Transportation equipment				Professional and scientific instruments				Other manufac- turing industries (27,31,39)
	Total (35)	Office, computing, and accounting machines (357)	Other machinery, except electrical (351-56, 358-59)	Total (36)	Radio and TV receiving equipment (365)	Communi- cation equipment (366)	Electronic com- ponents (367)	Other electrical equipment (361-64, 369)	Total (37)	Motor vehicles and motor vehicles equipment (371)	Other transpor- tation equipment (373-75, 379)	Aircraft and missiles (372,376)	Total (38)	Scientific and mechan- ical measuring instruments (381-82)	Optical, surgical, photo- graphic, and other instru- ments (384-87)		
Year	[Millions of current dollars]																
1986.....	D	D	75	5,213	0	4,552	D	D	17,708	D	D	14,984	351	D	D	2	2,706
1987.....	D	D	44	5,399	0	4,729	656	14	20,784	D	D	18,519	272	D	D	D	2,700
1988.....	D	D	101	4,153	0	3,630	449	74	20,865	D	D	18,402	191	S	95	D	3,256
1989.....	D	D	112	3,743	0	2,911	369	463	19,262	D	D	16,828	263	S	101	D	3,729
1990.....	871	D	D	4,133	0	2,344	418	1,371	17,097	D	D	15,248	737	S	87	D	4,442
1991.....	1,055	D	D	4,550	0	D	D	D	12,570	D	D	11,096	1,865	D	D	D	5,505
1992.....	1,035	D	D	3,844	D	D	247	D	11,202	D	D	S	2,221	2,143	78	61	5,570
1993.....	86	33	53	1,667	D	D	206	D	10,617	D	D	9,372	2,577	2,484	92	D	6,140
1994.....	99	28	71	1,801	D	D	162	D	10,392	D	D	8,794	3,384	3,266	118	D	5,090
1995.....	D	D	64	1,690	D	D	D	D	13,130	D	D	11,462	3,460	3,358	102	D	4,620
1996.....	117	D	D	2,143	D	D	D	D	12,202	D	D	10,515	3,942	D	D	D	3,633

See explanatory information and SOURCE at end of table.

Table B-18. Federal funds for industrial R&D performance, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Nonmanufacturing																				
	Transportation and utilities								Services												
	Total (40-42, 44-49)	Communications			Electric, gas, and sanitary services (49)	Other transport- ation and utilities (40-42, 44-47)			Total (701, 72-73, 75-81, 83-84, 87,89)	Business services			Health services		Engineering and management services			Other engineer- ing and manage- ment services (872,874)	Other services (701,72, 75-79, 81, 83-84, 89)	Other non-manu- facturing industries (07-12, 14-15, 161-162, 17)	
		Total (48)	Tele- phone (481)	Other (482- 484,489)						Computer and data process- ing (737)	Other business services (731- 736,738)	Total (80)	Doctors' offices and clinics, hospitals, and medical and dental labs (801, 806-807)	Other health services (802- 805, 808-809)	Total (87)	Engi- neering, architec- tural, and surveying (871)	Re- search, develop- ment, and testing (873)				
Year	[Millions of current dollars]										[millions of current dollars]										
1995.....	252	D	D	0	93	D	D	D	4,270	612	514	98	4	D	D	3,650	1,883	D	D	4	11
1996.....	186	D	D	0	42	D	51	D	3,118	361	D	D	D	3	D	2,746	994	1,708	45	D	D

See explanatory information and SOURCE at end of table.

**Table B-18. Federal funds for industrial R&D performance,
by industry and size of company: 1986-96**

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Distribution by size of company	Total	Number of employees					
		Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Year	[Millions of current dollars]						
1986.....	27,891	868	137	1,229	796	2,004	23,213
1987.....	30,752	963	115	981	748	2,362	25,583
1988.....	30,343	816	131	1,093	864	1,705	25,734
1989.....	28,554	901	117	958	740	1,129	24,709
1990.....	28,125	895	S	881	257	1,526	24,436
1991.....	26,372	1,887	181	1,050	816	3,373	19,065
1992.....	24,722	2,025	151	S	763	3,416	17,346
1993.....	22,809	1,614	182	1,115	764	2,816	16,319
1994.....	22,463	1,164	182	1,083	825	2,348	16,862
1995.....	23,451	1,978	225	798	243	1,946	18,261
1996.....	23,653	2,301	219	512	468	1,031	19,122

KEY: D = Data withheld to avoid disclosing operations of individual companies.

S = Data prior to 1993 withheld because of imputation of more than 50 percent. (For subsequent imputations of more than 50 percent the numbers are provided in the table, and the imputations are mentioned in NOTES.)

NOTES: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. Due to revisions in survey methodology, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" for 1996 are not comparable with statistics for prior years. More than 50 percent imputation was used for the 1995 values of "3,460" under the column "Prof. and scientific instruments, total" and "3,358" under "Scientific and mechanical measuring instruments." More than 50 percent imputation was also used for the 1996 values of "51" under "Trade" and "1,708" under "Research, development, and testing."

SOURCE: National Science Foundation/Division of Science Resources Studies, *Research and Development in Industry 1995-96*.

Table B-19. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Total for all industries	Manufacturing															
							Chemicals and allied products							Primary metals			
		Total manu- facturing	Food, kindred, and tobacco products (20,21)	Textiles and apparel (22,23)	Lumber, wood products, and furniture (24,25)	Paper and allied products (26)	Total (28)	Industrial chemicals (281–82, 286)	Drugs and medicines (283)	Other chemicals (284–85, 287–89)				Total (33)	Ferrous metals and products (331–32, 3398–99)	Nonferrous metals and products (333–36)		Fabricated metal products (34)
Year	[Percent]																
1986.....	NA	4.7	D	D	0.6	D	5.2	4.6	8.5	3.3	D	D	2.5	D	D	1.5	1.5
1987.....	NA	4.6	0.6	D	0.6	D	5.3	4.7	D	D	1.0	D	2.6	0.9	D	D	1.5
1988.....	NA	4.5	D	D	D	D	5.3	4.4	8.8	3.4	1.0	D	D	0.8	0.5	1.0	1.3
1989.....	NA	4.3	D	D	0.6	0.8	5.4	4.2	D	D	0.9	D	D	0.8	D	D	1.5
1990.....	NA	4.2	D	D	0.6	1.0	5.3	4.5	D	D	0.9	D	D	0.8	D	D	1.4
1991.....	NA	4.2	0.5	D	D	1.1	5.4	4.6	8.9	3.1	1.0	D	D	0.8	D	D	1.5
1992.....	NA	4.2	0.5	6.0	D	D	5.5	4.6	9.6	2.7	0.9	D	D	0.6	D	D	1.5
1993.....	NA	3.8	0.5	D	D	D	D	D	12.5	D	0.9	D	1.5	0.7	0.5	1.2	1.4
1994.....	NA	3.6	0.5	D	D	D	D	D	10.2	D	0.8	D	1.7	0.6	D	D	1.2
1995.....	3.4	3.6	0.5	D	D	D	4.7	D	10.4	D	0.7	D	1.5	0.5	D	D	1.1
1996.....	3.5	4.0	0.4	D	D	D	D	D	10.1	2.7	0.7	D	1.3	D	D	D	D

See explanatory information and SOURCE at end of table.

Table B-19. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Manufacturing (continued)															Total non- manu- facturing industries	
	Machinery			Electrical equipment					Transportation equipment				Professional and scientific instruments				Other manufac- turing industries (27,31,39)
	Total (35)	Office, computing, and accounting machines (357)	Other machinery, except electrical (351-56, 358-59)	Total (36)	Radio and TV receiving equipment (365)	Communi- cation equipment (366)	Electronic com- ponents (367)	Other electrical equipment (361-64, 369)	Total (37)	Motor vehicles and motor vehicles equipment (371)	Other transpor- tation equipment (373-75, 379)	Aircraft and missiles (372,376)	Total (38)	Scientific and mechan- ical measuring instruments (381-82)	Optical, surgical, photo- graphic, and other instru- ments (384-87)		
Year	[Percent]																
1986.....	D	D	3.0	7.9	3.6	9.9	D	D	8.3	D	D	13.4	8.8	D	D	1.2	NA
1987.....	D	D	3.0	8.2	3.2	10.2	10.0	2.7	8.7	D	D	14.7	7.9	D	D	D	NA
1988.....	7.7	D	2.9	7.5	2.4	10.7	9.0	2.5	8.9	D	D	16.3	7.4	7.9	7.3	D	NA
1989.....	7.9	D	D	7.3	1.8	11.6	D	D	8.1	D	D	13.5	7.2	7.4	7.3	D	NA
1990.....	7.7	D	D	6.5	1.6	10.0	8.3	3.7	7.5	D	D	11.8	8.0	8.6	7.7	D	NA
1991.....	8.1	D	D	6.5	D	D	7.9	D	7.3	D	D	12.1	9.1	10.0	8.1	D	NA
1992.....	7.8	D	D	5.6	D	D	7.5	D	7.1	D	D	11.8	9.4	10.6	8.3	D	NA
1993.....	4.6	9.9	2.6	6.2	D	D	8.1	D	6.4	D	D	12.5	9.7	11.5	8.1	D	NA
1994.....	3.8	7.9	2.5	5.9	D	D	7.5	D	5.9	D	D	13.8	9.2	11.0	7.3	D	NA
1995.....	D	D	2.4	6.0	D	D	D	D	6.1	D	D	12.9	10.3	12.4	8.2	D	2.7
1996.....	5.2	D	D	6.7	D	D	D	D	6.5	D	D	12.9	11.5	D	D	D	2.5

See explanatory information and SOURCE at end of table.

Table B-19. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Nonmanufacturing																					
	Transportation and utilities								Services													
	Total (40-42, 44-49)	Communications			Electric, gas, and sanitary services (49)	Other transport- ation and utilities (40-42, 44-47)			Total (701, 72-73, 75-81, 83-84, 87,89)	Business services			Health services			Engineering and management services			Other engineer- ing and manage- ment services (872,874)	Other services (701,72, 75-79, 81, 83-84, 89)	Other non-manu- facturing industries (07-12, 14-15, 161-162, 17)	
		Total (48)	Tele- phone (481)	Other (482- 484, 489)						Total (73)	Com- puter and data process- ing (737)	Other business services (731- 736,738)	Total (80)	Doctors' offices and clinics, hospitals, and medical and dental labs (801, 806-807)	Other health services (802- 805, 808-809)	Total (87)	Engi- neering, architec- tural, and surveying (871)	Re- search, develop- ment, and testing (873)				
Year	[Percent]										[Percent]											
1995.....	1.2	D	D	3.0	0.3	D	D	D	7.8	10.1	11.8	1.6	5.2	D	D	7.8	5.7	D	D	0.6	0.8	
1996.....	1.0	D	D	1.3	0.2	D	2.3	D	8.1	10.2	D	D	D	6.1	D	9.7	6.2	14.0	1.8	D	D	

See explanatory information and SOURCE at end of table.

Table B-19. Total (company, Federal, and other) R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1986-96

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Distribution by size of company	Total	Number of employees					
		Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Year	[Percent]						
1995.....	3.4	4.4	3.2	2.8	2.0	2.3	4.3
1996.....	3.5	6.0	3.1	3.0	2.7	2.5	4.0

KEY: D = Data withheld to avoid disclosing operations of individual companies.
NA = Not available.

NOTES: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. Due to revisions in survey methodology, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" for 1996 are not comparable with statistics for prior years. More than 50 percent imputation was used for the 1996 value of "6" under the column "Doctors' offices and clinics, . . ."

SOURCE: National Science Foundation/Division of Science Resources Studies, *Research and Development in Industry 1995-96*.

**Table B-20. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing companies,
by industry and size of company: 1986–96**

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Industries (and associated SIC codes)	Total for all industries	Manufacturing															
		Total manu- facturing	Food, kindred, and tobacco products (20,21)	Textiles and apparel (22,23)	Lumber, wood products, and furniture (24,25)	Paper and allied products (26)	Chemicals and allied products				Petroleum refining and extraction (13,29)	Rubber products (30)	Stone, clay, and glass products (32)	Primary metals			Fabricated metal products (34)
							Total (28)	Industrial chemicals (281–82, 286)	Drugs and medicines (283)	Other chemicals (284–85, 287–89)				Total (33)	Ferrous metals and products (331–32, 3398–99)	Nonferrous metals and products (333–36)	
Year	[Percent]																
1986.....	NA	3.2	0.6	0.5	0.6	0.7	5.1	4.4	8.4	3.3	1.1	1.7	2.4	1.0	0.7	1.5	1.4
1987.....	NA	3.1	0.6	0.4	0.6	0.6	5.2	4.4	8.7	3.3	1.0	1.6	2.5	0.9	0.6	1.3	1.2
1988.....	NA	3.1	0.5	0.4	0.6	0.8	5.2	4.2	8.8	3.4	1.0	1.7	2.0	0.7	0.5	1.0	1.1
1989.....	NA	3.1	0.5	0.5	0.6	0.8	5.4	4.1	8.9	3.9	0.9	1.9	1.8	0.7	0.5	1.0	1.2
1990.....	NA	3.1	0.5	0.6	0.6	1.0	5.3	4.4	8.8	3.4	0.9	2.1	1.7	0.8	0.5	1.2	1.1
1991.....	NA	3.2	0.5	0.6	0.9	1.1	5.3	4.4	8.9	3.0	1.0	2.3	1.6	0.8	0.5	1.2	1.2
1992.....	NA	3.3	0.5	0.6	0.9	1.0	5.4	4.4	9.6	2.7	0.9	2.3	1.6	0.6	0.4	0.7	1.1
1993.....	NA	3.1	0.5	0.6	0.7	1.1	6.0	4.4	12.5	2.7	0.9	2.1	1.5	0.7	0.4	1.2	1.1
1994.....	NA	2.9	0.5	0.6	0.6	1.0	5.1	3.3	10.2	2.5	0.8	2.3	1.5	0.6	0.3	0.9	1.0
	2.8	2.9	0.5	0.9	0.7	1.0	4.7	3.9	10.4	1.4	0.7	1.6	1.5	0.5	0.3	0.7	1.1
1996.....	3.0	3.3	0.4	0.8	1.4	1.2	5.3	3.7	10.1	2.7	0.7	1.8	1.2	0.6	0.4	1.0	1.4

See explanatory information and SOURCE at end of table.

**Table B-20. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing companies,
by industry and size of company: 1986-96**

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Industries (and associated SIC codes)	Manufacturing (continued)															Total non-manu- facturing industries	
	Machinery			Electrical equipment					Transportation equipment				Professional and scientific instruments				Other manufac- turing industries (27,31,39)
	Total (35)	Office, computing, and accounting machines (357)	Other machinery, except electrical (351–56, 358–59)	Total (36)	Radio and TV receiving equipment (365)	Communi- cation equipment (366)	Electronic com- ponents (367)	Other electrical equipment (361–64, 369)	Total (37)	Motor vehicles and motor vehicles equipment (371)	Other transpor- tation equipment (373–75, 379)	Aircraft and missiles (372,376)	Total (38)	Scientific and mechan- ical measuring instruments (381–82)	Optical, surgical, photo- graphic, and other instru- ments (384–87)		
Year	[Percent]																
1986.....	7.3	12.4	2.9	5.1	3.6	5.2	9.2	2.2	3.6	3.3	2.7	4.0	8.2	8.4	8.0	1.2	NA
1987.....	7.1	12.3	3.0	5.4	3.2	5.5	8.5	2.6	3.4	3.4	2.5	3.6	7.5	8.1	7.2	1.1	NA
1988.....	6.8	11.2	2.8	5.3	2.4	6.1	8.0	2.3	3.5	3.4	2.6	3.9	7.1	7.6	7.1	1.0	NA
1989.....	7.3	13.1	2.6	5.2	1.8	6.8	7.7	2.3	3.5	3.7	2.5	3.3	6.8	6.9	7.1	0.9	NA
1990.....	7.2	14.4	2.3	4.5	1.6	6.1	7.4	2.2	3.4	3.7	2.1	3.1	7.1	6.9	7.5	0.9	NA
1991.....	7.5	14.9	2.9	4.3	1.0	S	7.2	2.2	4.0	4.1	2.1	4.0	7.1	6.3	8.0	0.8	NA
1992.....	7.3	13.7	2.9	4.0	0.6	7.0	7.0	2.1	4.2	4.0	2.1	4.7	7.2	6.2	8.2	1.3	NA
1993.....	4.5	9.8	2.5	5.4	4.0	10.1	7.8	2.3	3.9	3.7	1.9	4.7	7.2	6.4	7.9	1.3	NA
1994.....	3.8	7.9	2.5	5.2	1.0	10.3	7.3	2.1	3.7	3.4	1.2	5.3	6.5	5.8	7.2	1.1	NA
1995.....	3.6	8.1	2.4	5.4	1.6	8.0	8.0	2.5	3.6	3.6	0.9	4.2	7.3	6.6	8.0	1.2	2.4
1996.....	5.1	9.9	2.9	6.1	2.0	8.5	8.5	2.6	4.1	4.2	1.2	4.5	7.7	6.7	8.6	2.5	2.2

See explanatory information and SOURCE at end of table.

**Table B-20. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing companies,
by industry and size of company: 1986-96**

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Industries (and associated SIC codes)	Nonmanufacturing																						
	Transportation and utilities								Services														
		Communications				Other transpor- tation and utilities (40-42, 44-47)				Finance, insur- ance, and real estate (60-65, 67)	Total (701, 72-73, 75-81, 83-84, 87,89)	Business services			Health services			Engineering and management services				Other services (701,72, 75-79, 81, 83-84, 89)	Other non- manu- facturing industries (07-12, 14-15, 161-162, 17)
	Total (40-42, 44-49)	Total (48)	Tele- phone (481)	Other (482- 484,489)	Electric, gas, and sanitary services (49)		Trade (50-59)				Computer and data process- ing (737)	Other business services (731- 736,738)	Total (80)	Doctors' offices and clinics, hospitals, and medical and dental labs (801, 806-807)	Other health services (802- 805, 808-809)	Total (87)	Engi- neering, architec- tural, and surveying (871)	Re- search, develop- ment, and testing (873)	Other engineer- ing and manage- ment services (872,874)				
Year	[Percent]										[Percent]												
1995.....	1.1	2.2	2.1	3.0	2.0	0.1	2.4	0.7	5.9	9.5	11.1	0.9	5.2	5.3	2.4	4.1	2.0	7.2	1.7	0.6	0.8		
1996.....	1.0	1.9	1.9	1.3	0.2	0.3	2.3	0.4	6.8	9.9	12.4	1.1	5.9	6.1	3.4	6.1	2.5	9.7	1.3	0.7	2.5		

See explanatory information and SOURCE at end of table.

Table B-20. Company and other (except Federal) R&D funds as a percent of net sales in R&D-performing companies, by industry and size of company: 1986-96

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Distribution by size of company	Total	Number of employees					
		Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Year	[Percent]						
1995.....	2.8	3.9	3.0	2.6	2.0	2.0	3.1
1996.....	3.0	5.3	3.0	2.9	2.6	2.4	2.9

KEY: S = Data prior to 1993 withheld because of imputation of more than 50 percent. (For subsequent imputations of more than 50 percent the numbers are provided in the table, and the imputations are mentioned in NOTES.)

NA = not available.

NOTES: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. Due to revisions in survey methodology, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" for 1996 are not comparable with statistics for prior years. More than 50 percent imputation was used for the two 1996 values of "6" under the columns "Health services, total" and "Doctors' offices and clinics, . . ."

SOURCE: National Science Foundation/Division of Science Resources Studies, *Research and Development in Industry 1995-96*.

**Table B-21. Funds for performance of industrial basic research, applied research, and development,
by industry and source of funds: 1996**

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Industries (and associated SIC codes)	Total for all industries	Manufacturing											
		Total manufac- turing	Food, kindred, and tobacco products (20,21)	Textiles and apparel (22,23)	Lumber, wood products, and furniture (24,25)	Paper and allied products (26)	Chemicals and allied products				Petroleum refining and extraction (13,29)	Rubber products (30)	Stone, clay, and glass products (32)
							Total (28)	Industrial chemicals (281 82, 286)	Drugs and medicines (283)	Other chemicals (284 85, 287 89)			
Character of work/ source of funds	[Millions of current dollars]												
Total R&D													
All sources.....	144,667	111,864	1,564	D	D	D	D	D	9,773	2,505	1,654	D	468
Federal sources.....	23,653	20,020	0	D	D	D	D	D	3	0	24	D	5
Company sources.....	121,015	91,845	1,564	414	634	1,534	17,520	5,246	9,769	2,505	1,630	1,269	463
Basic research													
All sources.....	8,207	D	100	50	37	313	1,628	D	D	67	D	D	D
Federal sources.....	1,358	D	0	0	0	0	8	D	D	0	D	D	D
Company sources.....	6,848	4,851	100	50	37	313	1,620	697	856	67	D	67	21
Applied research													
All sources.....	29,241	D	508	D	D	D	D	D	D	1,041	592	D	D
Federal sources.....	3,871	D	0	D	D	D	D	D	D	0	2	D	D
Company sources.....	25,370	19,711	508	43	122	706	5,667	1,468	3,157	1,041	590	251	162
Development													
All sources.....	107,218	83,661	957	D	475	D	D	D	5,758	1,396	D	D	D
Federal sources.....	18,423	16,379	0	D	0	D	D	D	2	0	D	D	D
Company sources.....	88,798	67,284	957	321	475	515	10,233	3,081	5,755	1,396	D	951	280

See explanatory note and SOURCE at end of table.

**Table B-21. Funds for performance of industrial basic research, applied research, and development,
by industry and source of funds: 1996**

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Industries (and associated SIC codes)	Manufacturing											
	Primary metals				Machinery			Electrical equipment				
	Total (33)	Ferrous metals and products (331–32, 3398–99)	Nonferrous metals and products (333–36)		Fabricated metal products (34)	Total (35)	Office, computing, and accounting machines (357)	Other machinery, except electrical (351–56, 358–59)	Total (36)	Radio and TV receiving equipment (365)	Communi- cation equipment (366)	Electronic com-ponents (367)	Other electrical equipment (361–64, 369)
Character of work/ source of funds	[Millions of current dollars]											
Total R&D												
All sources.....	D	D	D	D	13,455	D	D	22,498	D	D	D	D
Federal sources.....	D	D	D	D	117	D	D	2,143	D	D	D	D
Company sources.....	637	214	422	1,322	13,338	8,132	5,206	20,356	140	4,359	12,497	3,360
Basic research												
All sources.....	D	6	D	D	D	D	D	D	22	D	D	D
Federal sources.....	D	D	0	D	D	D	D	D	D	D	D	D
Company sources.....	D	D	D	140	397	65	332	531	D	18	D	228
Applied research												
All sources.....	D	D	D	D	D	D	D	D	D	D	4,799	D
Federal sources.....	D	0	D	D	D	D	D	D	0	D	D	D
Company sources.....	167	D	D	247	2,409	1,629	780	4,926	D	751	D	582
Development												
All sources.....	754	D	D	D	10,605	D	D	15,662	D	3,999	8,767	D
Federal sources.....	D	D	D	D	73	D	D	764	D	410	116	D
Company sources.....	D	D	315	934	10,532	6,438	4,094	14,898	107	3,590	8,651	2,550

See explanatory note and SOURCE at end of table.

**Table B-21. Funds for performance of industrial basic research, applied research, and development,
by industry and source of funds: 1996**

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	Manufacturing								Total non-manu- facturing industries
Industries (and associated SIC codes)	Transportation equipment				Professional and scientific instruments			Other manu- facturing industries (27,31,39)	
	Total (37)	Motor vehicles and motor vehicles equipment (371)	Other transpor- tation equipment (373 75, 379)	Aircraft and missiles (372,376)	Total (38)	Scientific and mechanical measuring instruments (381 82)	Optical, surgical, photo- graphic, and other instru- ments (384 87)		
Character of work/ source of funds	[Millions of current dollars]								
Total R&D									
All sources.....	32,737	D	D	16,224	12,149	D	D	D	32,803
Federal sources.....	12,202	D	D	10,515	3,942	D	D	D	3,633
Company sources.....	20,535	14,528	298	5,710	8,207	3,283	4,924	2,423	29,170
Basic research									
All sources.....	D	104	D	D	D	D	D	D	D
Federal sources.....	D	D	0	D	D	D	D	D	D
Company sources.....	277	D	D	D	943	455	488	247	1,997
Applied research									
All sources.....	D	D	167	D	1,099	482	617	973	D
Federal sources.....	D	D	D	D	67	31	35	455	D
Company sources.....	2,361	D	D	D	1,032	450	582	518	5,659
Development									
All sources.....	28,648	D	D	13,259	D	D	D	1,738	23,557
Federal sources.....	10,752	D	D	9,264	D	D	D	80	2,044
Company sources.....	17,898	13,753	149	3,995	6,232	2,378	3,854	1,658	21,514

See explanatory note and SOURCE at end of table.

**Table B-21. Funds for performance of industrial basic research, applied research, and development,
by industry and source of funds: 1996**

	Nonmanufacturing											
Industries (and associated SIC codes)	Transportation and utilities						Services					
	Total (40 42, 44 49)	Communications			Electric, gas, and sanitary services (49)	Other transportation and utilities (40 42, 44 47)	Trade (50 59)	Finance, insurance, and real estate (60 65,67)	Total (701, 72 73, 75 81, 83 84,87, 89)	Business services		
		Total (48)	Telephone (481)	Other (482 484, 489)						Total (73)	Computer and data processing (737)	Other business services (731 736, 738)
Character of work/ source of funds	[Millions of current dollars]											
Total R&D												
All sources.....	4,678	D	D	73	352	D	6,389	D	19,022	10,641	D	D
Federal sources.....	186	D	D	0	42	D	51	D	3,118	361	D	D
Company sources.....	4,492	3,970	3,897	73	311	211	6,338	1,280	15,904	10,280	10,025	255
Basic research												
All sources.....	D	D	D	D	15	D	D	12	1,699	593	550	41
Federal sources.....	D	0	0	0	0	D	D	D	360	84	84	0
Company sources.....	D	D	D	D	15	D	405	D	1,339	509	467	41
Applied research												
All sources.....	D	D	D	16	D	D	1,462	D	3,952	1,328	D	D
Federal sources.....	D	D	D	D	D	0	0	0	1,006	51	D	D
Company sources.....	D	D	D	D	73	D	1,462	D	2,946	1,277	1,244	33
Development												
All sources.....	3,650	D	D	D	D	221	D	1,177	13,371	8,720	D	D
Federal sources.....	180	D	D	D	D	12	D	2	1,752	226	D	D
Company sources.....	3,469	3,040	2,982	57	223	209	4,471	1,174	11,619	8,494	8,314	181

See explanatory note and SOURCE at end of table.

**Table B-21. Funds for performance of industrial basic research, applied research, and development,
by industry and source of funds: 1996**

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	Nonmanufacturing								
	Services								
	Health services			Engineering and management services					
		Doctors' offices and clinics, hospitals, and medical and dental labs	Other health services		Engineering, architectural, and surveying	Research, development, and testing	Other engineering and management services	Other services	Other non- manufacturing industries
Industries (and associated SIC codes)	Total (80)	(801, 806 807)	(802 805, 808 809)	Total (87)	(871)	(873)	(872,874)	(701,72, 75 79, 81,83 84, 89)	(07 12, 14 15, 161 162, 17)
Character of work/ source of funds	[millions of current dollars]								
Total R&D									
All sources.....	D	715	D	7,318	1,660	5,484	173	D	D
Federal sources.....	D	3	D	2,746	994	1,708	45	D	D
Company sources.....	735	713	23	4,572	667	3,776	129	317	1,156
Basic research									
All sources.....	D	48	D	1,029	D	795	D	D	46
Federal sources.....	D	D	0	274	D	128	D	D	0
Company sources.....	50	D	D	757	D	667	D	25	46
Applied research									
All sources.....	D	D	12	2,324	D	1,772	D	D	547
Federal sources.....	D	D	D	949	D	603	D	D	218
Company sources.....	252	D	D	1,376	D	1,168	D	42	329
Development									
All sources.....	D	D	D	3,965	943	2,917	101	D	D
Federal sources.....	D	D	0	1,523	546	977	1	D	D
Company sources.....	433	D	D	2,439	398	1,941	101	250	781

See explanatory note and SOURCE at end of table.

Table B-21. Funds for performance of industrial basic research, applied research, and development, by industry and source of funds: 1996

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KEY: D = Data withheld to avoid disclosing operations of individual companies.

NOTES: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. Due to revisions in survey methodology, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" for 1996 are not comparable with statistics for prior years. More than 50 percent imputation was used for: row "total R&D, all sources," columns "Doctors'..." (715); row "Total R&D, Federal sources," columns "Trade" (51), and "Research & dev...." (1,708); row "Total R&D, company sources," columns "Health services, total" (735), "Doctors'..." (713); row "Basic research, all sources," column "Paper..." (313); row "Basic research, company sources," column "Paper..." (706), and "Health services, total" (252); row "Development, Federal sources of development, for the columns, "Total for all industries" (18,423), "Drugs and medicines" (2), "Transportation equip., total" (10,752), "Aircraft and missiles" (9,264), "Nonmanufacturing" (2,044), "Services, total" (1,752), "Eng. and management services" (1,523) and "Research, development and testing" (977); and row "Development, company sources," column "Health services, total" (433).

SOURCE: National Science Foundation/Division of Science Resources Studies, *Research and Development in Industry 1995-96*.

Table B-22. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1986-97

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Industries (and associated SIC codes)	Total for all industries (annual average)	Total for all industries (January)	Manufacturing															
								Chemicals and allied products				Petroleum refining and extraction (13,29)	Rubber products (30)	Stone, clay, and glass products (32)	Primary metals			
			Total manufacturing	Food, kindred, and tobacco products (20,21)	Textiles and apparel (22,23)	Lumber, wood products, and furniture (24,25)	Paper and allied products (26)	Total (28)	Industrial chemicals (281–82, 286)	Drugs and medicines (283)	Other chemicals (284–85, 287–89)				Total (33)	Ferrous metals and products (331–32, 3398–99)	Nonferrous metals and products (333–36)		Fabricated metal products (34)
Year	[Thousands]																	
1986.....	683.4	671.0	NA	S	2.6	S	6.4	75.8	24.9	31.8	19.1	10.4	S	7.5	5.7	2.5	3.2	S
1987.....	702.2	695.8	NA	S	2.4	1.3	6.0	75.2	S	32.6	20.2	9.9	S	8.6	5.5	S	3.4	9.9
1988.....	715.6	708.6	NA	S	2.4	1.3	6.1	75.8	S	33.0	20.3	9.5	S	8.6	5.6	2.3	3.3	10.5
1989.....	733.0	722.5	NA	S	2.5	1.4	6.4	78.3	S	34.4	18.8	10.7	S	7.6	5.5	2.3	3.3	9.9
1990.....	758.5	743.6	NA	S	2.8	S	8.5	80.4	S	34.3	18.9	11.1	S	7.0	5.2	S	3.3	10.1
1991.....	776.4	773.4	NA	9.4	S	S	S	81.6	S	35.4	17.0	11.4	S	6.0	4.6	S	3.0	S
1992.....	772.0	779.3	NA	9.8	2.8	1.5	10.7	85.6	29.9	38.7	17.0	11.5	14.8	5.3	5.1	1.7	S	8.7
1993.....	766.6	764.7	NA	9.6	3.1	1.6	10.6	86.5	26.4	42.3	17.8	11.0	13.0	5.1	4.6	1.6	S	7.9
1994.....	758.8	768.5	NA	10.3	3.3	3.3	10.6	93.1	28.8	48.5	15.8	9.7	9.0	4.0	5.1	2.6	2.5	10.2
1995.....	789.4	746.1	547.2	8.9	2.9	2.3	10.6	99.6	33.7	50.3	15.6	8.4	9.8	4.3	6.5	1.9	4.6	9.2
1996.....	791.0	832.8	606.2	9.8	3.8	2.9	11.0	94.3	28.4	49.0	16.9	8.4	10.2	3.9	4.1	1.6	2.5	9.1
1997 prel...	859.3	885.7	639.9	10.4	3.7	3.4	11.2	89.0	31.2	43.1	14.8	9.0	9.9	3.7	5.5	1.6	3.9	10.0

See explanatory information and SOURCE at end of table.

Table B-22. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1986-97

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Industries (and associated SIC codes)	Manufacturing (continued)																Total non- manu- facturing industries
	Machinery			Electrical equipment					Transportation equipment				Professional and scientific instruments			Other manu- facturing indus- tries (27,31,39)	
	Total (35)	Office, compu- ting, and account- ing machines (357)	Other machin- ery, except electrical (351-56, 358-59)	Total (36)	Radio and TV receiving equip- ment (365)	Communi- cation equip- ment (366)	Electronic com- ponents (367)	Other electrical equip- ment (361-64, 369)	Total (37)	Motor vehicles and motor vehicles equip- ment (371)	Other transpor- tation equip- ment (373-75, 379)	Aircraft and missiles (372,376)	Total (38)	Scientific and mechani- cal meas- uring instru- ments (381-82)	Optical, surgical, photo- graphic, and other instru- ments (384-87)		
Year	[Thousands]																
1986.....	89.7	71.9	17.8	117.9	1.8	65.0	S	16.5	179.2	33.9	S	144.8	S	S	24.0	S	75.1
1987.....	95.8	73.4	22.4	130.4	1.2	71.9	43.7	13.6	187.3	46.5	S	136.3	S	S	24.6	6.3	96.4
1988.....	98.4	74.4	24.0	132.5	1.3	73.1	44.3	S	188.2	47.3	S	136.4	S	S	24.9	6.4	101.9
1989.....	100.4	75.0	25.4	122.5	1.5	58.0	42.8	S	185.4	45.8	S	134.8	S	S	14.5	5.4	125.2
1990.....	113.3	84.7	28.6	105.2	0.8	47.1	S	21.3	170.2	49.4	S	115.3	S	S	8.1	5.6	S
1991.....	109.7	77.6	32.1	95.9	1.0	35.8	32.6	S	149.7	45.3	S	100.2	S	S	S	S	S
1992.....	99.3	67.1	32.2	91.9	1.0	31.2	28.4	31.2	141.1	44.5	S	92.9	S	S	S	6.0	202.6
1993.....	97.4	65.8	31.6	89.2	1.0	S	28.9	28.8	147.5	45.1	S	97.9	S	S	20.8	5.8	196.5
1994.....	70.4	34.6	35.8	96.5	0.8	36.0	40.1	19.6	129.6	51.0	5.8	72.8	100.6	66.4	34.2	15.5	197.4
1995.....	68.6	31.8	36.8	103.3	0.9	41.7	40.8	20.0	120.8	51.1	6.2	63.5	84.4	63.2	21.2	7.5	198.9
1996.....	87.3	33.7	53.6	125.8	1.3	34.7	64.6	25.3	156.6	57.0	4.0	95.5	70.9	48.2	22.7	8.2	226.6
1997 prel...	88.7	45.3	43.4	135.9	1.6	37.6	75.3	21.4	161.8	63.8	3.4	94.6	64.3	42.6	21.7	33.4	245.8

See explanatory information and SOURCE at end of table.

Table B-22. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1986-97

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Industries (and associated SIC codes)	Nonmanufacturing																					
	Transportation and utilities								Services													
	Communications				Other transpor- tation and utilities (40-42), 44-47)	Trade (50-59)			Finance, insur- ance, and real estate (60-65, 67)	Total (701, 72-73, 75-81, 83-84, 87,89)	Business services			Health services			Engineering and management services			Other engineer- ing and manage- ment services (872,874)	Other services (701,72, 75-79, 81, 83-84, 89)	Other non- manu- facturing industries (07-12, 14-15, 161-162, 17)
	Total (40- 42, 44-49)	Total (48)	Tele- phone (481) 484, 489)								Other (482- 484, 489)	Electric, gas, and sanitary services (49)	Com- puter and data process- ing (737)	Other business services (731- 736,738)	Total (80)	Doctors' offices and clinics, hospitals, and medical and dental labs (801, 806-807)	Other health services (802- 805, 808-809)	Total (87)	Engi- neering, architec- tural, and surveying (871)				Re- search, develop- ment, and testing (873)
Year	[Thousands]										[Thousands]											
1996.....	29.3	25.4	24.7	0.8	3.2	0.7	47.5	5.6	139.6	80.2	77.3	3.0	5.0	4.4	0.6	52.9	22.8	28.8	1.4	1.5	4.6	
1997 prel...	29.4	24.7	23.9	0.8	4.0	0.8	39.6	15.9	143.9	87.8	85.1	2.8	6.6	6.3	0.3	45.3	18.0	24.9	2.3	4.2	17.0	

See explanatory information and SOURCE at end of table.

Table B-22. Number of full-time-equivalent (FTE) R&D scientists and engineers in R&D-performing companies, by industry and size of company: 1986-97

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Distribution by size of company	Total	Number of employees					
		Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Year	[Thousands]						
1986.....	671.0	S	S	66.7	38.9	88.4	365.3
1987.....	695.8	105.2	18.4	76.4	40.5	92.0	363.3
1988.....	708.6	109.0	19.3	81.9	40.2	94.5	363.7
1989.....	722.5	105.4	18.0	76.1	47.3	87.0	388.7
1990.....	743.6	S	18.6	75.4	57.2	73.9	404.2
1991.....	773.4	S	18.6	79.3	55.1	90.3	408.4
1992.....	779.3	142.1	46.2	94.2	57.6	99.9	339.2
1993.....	764.7	125.1	46.1	99.3	56.4	102.6	335.2
1994.....	768.5	148.6	27.9	108.9	60.3	90.6	332.1
1995.....	746.1	139.8	29.7	110.8	52.8	91.8	321.2
1996.....	832.8	165.1	36.6	124.4	61.1	97.0	348.6
1997.....	885.7	177.3	37.7	131.6	82.2	104.9	351.9

KEY: S = Data prior to 1993 withheld because of imputation of more than 50 percent. (For subsequent imputations of more than 50 percent the numbers are provided in the table, and the imputations are mentioned in NOTES.)
NA = not available.

NOTES: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. Due to revisions in survey methodology, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" for 1996 are not comparable with statistics for prior years. More than 50 percent imputation was used for the 1994 values of "36.0" under "Communication equip.", "5.8" under "other transportation equip.", "100.6" under "Prof. and scientific instr., total", and "66.4" under "Scientific and mechanical measuring instruments"; the 1995 value "41.7" under "Communication equip."; and for the 1996 values of "11.0" under "Paper and . . .", "34.7" under "Communication equip.", "64.6" under "Electronic components", "70.9" under "Prof. and scientific was used for the preliminary 1997 values of "11.2" under "Paper and . . .", "5.5" under "Primary metals, total", "3.9" under "Nonferrous metals . . .", "37.6" under "Communication equip.", "75.3" under "Electronic components", "161.8" under "Transportation equip., total", "94.6" under "Aircraft . . .", "64.3" under "Prof. And scientific instruments", "42.6" under "Scientific and mechanical measuring instruments", "4.0" under "Elec., gas, and sanitary serv.", "0.3" under "Other health serv.", "2.3" under "Other eng. . . serv.", and "351.9" under "25,000 or more."

SOURCE: National Science Foundation/Division of Science Resources Studies, *Research and Development in Industry 1995-96*.

Table B-23. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Total for all industries	Manufacturing															Fabricated metal products (34)
		Total manu- facturing	Food, kindred, and tobacco products (20,21)	Textiles and apparel (22,23)	Lumber, wood products, and furniture (24,25)	Paper and allied products (26)	Chemicals and allied products				Petroleum refining and extraction (13,29)	Rubber products (30)	Stone, clay, and glass products (32)	Primary metals			
							Total (28)	Industrial chemicals (281–82, 286)	Drugs and medicines (283)	Other chemicals (284–85, 287–89)				Total (33)	Ferrous metals and products (331–32, 3398–99)	Non- ferrous metals and products (333–36)	
Year	[Current dollars]																
1986.....	128,500	NA	D	D	S	D	117,100	150,200	113,600	83,100	D	D	118,000	D	D	138,800	S
1987.....	128,800	NA	S	D	S	D	125,000	S	D	D	187,400	D	122,500	131,500	D	D	76,600
1988.....	132,300	NA	D	D	D	D	139,400	S	142,800	105,600	182,700	D	D	118,600	S	S	88,100
1989.....	134,500	NA	D	D	S	S	149,000	S	D	D	194,000	D	D	S	D	D	S
1990.....	141,300	NA	D	D	S	S	159,000	S	D	D	201,800	D	D	D	D	D	S
1991.....	148,600	NA	130,000	D	D	D	167,600	181,000	D	D	217,000	D	D	142,200	D	D	115,500
1992.....	157,912	NA	144,215	D	D	D	183,508	193,871	196,631	135,423	205,318	D	D	114,057	D	D	123,828
1993.....	153,336	NA	135,261	D	D	D	D	D	202,607	D	208,360	D	137,990	138,552	138,851	138,326	129,131
1994.....	157,601	NA	153,609	D	D	D	D	D	195,145	D	209,439	D	141,842	116,556	D	D	113,168
1995.....	167,339	173,523	167,017	D	D	D	180,971	D	205,637	D	209,495	D	110,172	111,743	D	D	112,010
1996.....	168,362	179,538	154,853	D	D	D	D	D	212,185	158,355	189,981	D	124,685	D	D	D	D

See explanatory information and SOURCE at end of table.

Table B-23. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Manufacturing (continued)															Total non- manu- facturing industries	
	Machinery			Electrical equipment					Transportation equipment				Professional and scientific instruments				Other manu- facturing industries (27,31,39)
	Total (35)	Office, comput- ing, and account- ing machines (357)	Other machin- ery, except electrical (351-56, 358-59)	Total (36)	Radio and TV receiving equipment (365)	Communi- cation equipment (366)	Electronic com- ponents (367)	Other electrical equipment (361-64, 369)	Total (37)	Motor vehicles and motor vehicles equipment (371)	Other transpor- tation equipment (373-75, 379)	Aircraft and missiles (372,376)	Total (38)	Scientific and mechan- ical meas- uring instru- ments (381-82)	Optical, surgical, photo- graphic, and other instru- ments (384-87)		
Year	[Current dollars]																
1986.....	D	D	119,200	120,700	88,700	141,300	D	D	170,700	D	S	149,800	S	D	D	S	86,800
1987.....	D	D	98,300	124,300	97,900	155,300	98,400	S	183,400	D	S	180,400	S	D	D	D	69,100
1988.....	D	D	99,400	124,100	124,200	160,300	S	68,500	195,600	D	D	193,300	S	S	316,700	D	74,900
1989.....	130,000	D	D	132,400	103,400	170,600	S	S	211,700	D	D	207,300	S	S	S	D	S
1990.....	138,500	D	D	142,800	113,200	177,100	128,400	S	215,700	D	D	213,700	S	S	S	D	S
1991.....	147,800	D	D	147,100	D	S	D	D	189,400	D	D	177,000	S	S	S	D	137400
1992.....	152,797	D	D	150,118	D	D	127,801	D	191,274	D	D	180,552	S	S	S	D	152,411
1993.....	100,631	99,564	102,213	144,725	D	D	154,366	D	196,777	D	D	176,450	115,180	94,036	161,721	D	159,188
1994.....	118,717	126,476	111,691	151,872	D	D	148,761	D	228,881	D	D	217,219	119,693	102,570	161,435	D	142,125
1995.....	D	D	111,421	163,626	D	D	D	D	233,968	D	D	213,328	154,251	128,237	220,383	D	150,578
1996.....	152,894	D	D	171,907	D	D	D	D	205,665	D	D	170,733	179,723	D	D	D	138,882

See explanatory information and SOURCE at end of table.

Table B-23. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1986-96

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Industries (and associated SIC codes)	Nonmanufacturing																				
	Transportation and utilities						Trade (50–59)	Finance, insur- ance, and real estate (60–65, 67)	Services												
	Total (40–42, 44–49)	Communications			Electric, gas, and sanitary services (49)	Other transpor- tation and utilities (40–42, 44–47)			Total (701, 72–73, 75–81, 83–84, 87,89)	Business services			Health services			Engineering and management services			Other engi- neering and manage- ment services (872, 874)	Other services (701,72, 75–79, 81, 83–84, 89)	Other non- manu- facturing industries (07–12, 14–15, 161–162, 17)
		Total (48)	Tele- phone (481)	Other (482– 484,489)						Total (73)	Com- puter and data process- ing (737)	Other business services (731– 736,738)	Total (80)	Doctors' offices and clinics, hospitals, and medical and dental labs (801, 806–807)	Other health services (802– 805, 808– 809)	Total (87)	Engi- neering, architec- tural, and surveying (871)	Re- search, develop- ment, and testing (873)			
Year	[Current dollars]																				
1995.....	370,933	D	D	157,435	274,704	D	D	D	256,085	231,680	234,483	158,453	305,132	D	D	289,459	257,067	D	D	221,147	179,020
1996.....	159,442	D	D	94,495	98,427	D	146,774	D	134,175	126,625	D	D	D	133,871	D	149,040	81,271	204,445	93,929	D	D

See explanatory information and SOURCE at end of table.

Table B-23. Cost per R&D scientist or engineer in R&D-performing companies, by industry and size of company: 1986-96

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Distribution by size of company	Total	Number of employees					
		Less than 500	500 to 999	1,000 to 4,999	5,000 to 9,999	10,000 to 24,999	25,000 or more
Year	[Current dollars]						
1986.....	128,500	70,600	103,400	106,400	108,400	122,300	154,300
1987.....	128,800	66,800	92,600	91,900	102,900	132,700	157,700
1988.....	132,300	67,100	S	100,600	100,400	143,000	160,700
1989.....	134,500	66,200	98,200	101,900	102,500	127,300	168,200
1990.....	141,300	S	S	91,400	110,800	135,300	193,700
1991.....	148,600	103,400	178,700	119,400	150,800	167,300	180,100
1992.....	157,912	111,358	176,585	127,135	148,285	156,190	182,839
1993.....	153,336	106,888	87,233	128,565	156,899	160,229	184,804
1994.....	157,601	85,793	138,366	139,693	152,227	182,243	195,890
1995.....	167,339	109,319	141,660	144,213	167,284	180,849	200,606
1996.....	168,362	118,280	124,765	142,747	161,035	199,722	199,286

KEY: D = Data withheld to avoid disclosing operations of individual companies.

S = Data prior to 1993 withheld because of imputation of more than 50 percent. (For subsequent imputations of more than 50 percent the numbers are provided in the table, and the imputations are mentioned in NOTES.)

NOTES: As a result of a new sample design, statistics for 1988-91 have been revised since originally published. These statistics now better reflect R&D performance among firms in the nonmanufacturing industries and small firms in all industries. As a result of the new sample design, statistics for 1991 and later years are not directly comparable with statistics for 1990 and earlier years. Due to revisions in survey methodology, statistics for "Other manufacturing industries" and for "Other nonmanufacturing industries" for 1996 are not comparable with statistics for prior years. More than 50 percent imputation was used for the 1993 values of "115,180" under "Prof. and scientific instruments, total" and "94,036" under "Sci. and mechanical measuring instruments"; for the 1994 values of "119,693" and "102,570" for the same columns, respectively; the 1995 values of "274,704" under "Elec., gas, and sanitary serv." and "257,067" under "Eng., architectural, and surveying." More than 50 percent imputation was used for the 1996 values of "205,665" under "Transportation equip., total", "170,733" under "Aircraft . . .", "179,723" under "Prof. and scientific instruments, total", "98,427" under "Elec., gas, and sanitary serv.", "133,871" under "Doctors' offices . . .", "81,271" under "Eng., architectural, and surveying", "93,929" under "Other engineering . . . serv.", and "199,286" under "25,000 or more."

SOURCE: National Science Foundation/Division of Science Resources Studies, *Research and Development in Industry 1995-96*.

Table B-24. R&D expenditures at universities and colleges, by source of funds and science and engineering field: fiscal years 1989–96

Page 1 of 2

Source and field	1989	1990	1991	1992	1993	1994	1995	1996
	[Millions of current dollars]							
Total.....	14,976	16,285	17,584	18,816	19,948	21,051	22,207	22,995
Source of funds:								
Federal Government.....	8,990	9,637	10,233	11,091	11,954	12,668	13,356	13,810
State and local governments.....	1,223	1,324	1,473	1,490	1,558	1,541	1,681	1,725
Industry.....	995	1,128	1,205	1,280	1,361	1,414	1,483	1,576
Institutional funds.....	2,697	3,006	3,366	3,547	3,589	3,848	4,072	4,232
All other sources.....	1,071	1,191	1,307	1,409	1,486	1,579	1,617	1,653
Field:								
Engineering, total.....	2,392	2,657	2,907	3,063	3,156	3,341	3,500	3,675
Aeronautical and astronautical.....	148	164	180	197	213	214	238	230
Chemical.....	194	218	244	261	274	278	297	311
Civil.....	245	284	315	339	371	399	425	450
Electrical.....	595	663	679	704	698	743	817	876
Mechanical.....	343	391	421	451	483	498	518	520
Metallurgical and materials 1/.....	NA	274	304	294	299	309	329	360
Other, n.e.c.....	867	663	764	817	818	899	877	928
All sciences, total.....	12,584	13,629	14,677	15,753	16,792	17,710	18,707	19,321
Physical sciences.....	1,647	1,807	1,939	2,055	2,130	2,172	2,251	2,260
Astronomy.....	137	170	211	238	259	269	307	279
Chemistry.....	606	648	671	705	740	759	772	801
Physics.....	786	842	881	921	940	951	981	990
Other, n.e.c.....	117	147	176	191	191	193	191	190
Environmental sciences.....	1,003	1,068	1,117	1,240	1,317	1,407	1,444	1,478
Atmospheric.....	165	173	175	194	210	207	211	225
Earth sciences.....	324	354	384	413	416	465	464	453
Oceanography.....	359	377	390	428	459	455	477	518
Other, n.e.c.....	156	163	169	205	232	281	293	282
Mathematical sciences.....	215	222	230	248	272	282	280	289
Computer sciences.....	473	515	554	555	608	648	687	702
Life sciences.....	8,061	8,726	9,472	10,196	10,851	11,497	12,227	12,697
Agricultural sciences.....	1,282	1,349	1,458	1,512	1,559	1,666	1,818	1,890
Biological sciences.....	2,640	2,859	3,064	3,303	3,536	3,735	3,866	3,971
Medical sciences.....	3,819	4,154	4,546	4,964	5,324	5,639	6,072	6,355
Other, n.e.c.....	321	363	404	417	433	457	470	481

See explanatory information and SOURCE at end of table.

Table B-24. R&D expenditures at universities and colleges, by source of funds and science and engineering field: fiscal years 1989–96

Page 2 of 2

Source and field	1989	1990	1991	1992	1993	1994	1995	1996
	[Millions of current dollars]							
Psychology.....	234	253	283	328	350	357	368	372
Social sciences.....	633	703	750	815	896	954	1,019	1,104
Economics.....	187	201	209	222	231	243	250	271
Political science.....	103	115	125	142	151	163	175	185
Sociology	119	132	156	163	183	196	214	235
Other, n.e.c.	224	255	260	288	331	352	381	413
Other sciences, n.e.c.....	318	336	332	315	368	392	430	419

1/ Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

KEY: n.e.c. = Not elsewhere classified.
NA = Not available.

NOTE: Because of rounding, figures may not add to the totals shown.

SOURCE: National Science Foundation/Division of Science Resources Studies, *Academic Research and Development Expenditures, Fiscal Year 1996*.

Table B-25. Federally financed R&D expenditures at universities and colleges, by science and engineering field: fiscal years 1989–96

Page 1 of 1

Source and field	1989	1990	1991	1992	1993	1994	1995	1996
	[Millions of current dollars]							
Total.....	8,990	9,637	10,233	11,091	11,954	12,668	13,356	13,810
Field:								
Engineering, total.....	1,384	1,526	1,638	1,753	1,858	1,990	2,098	2,216
Aeronautical and astronautical.....	115	127	138	151	160	162	181	168
Chemical.....	101	110	118	126	143	150	161	171
Civil.....	102	117	124	144	154	164	184	196
Electrical.....	387	432	436	449	458	490	545	592
Mechanical.....	214	238	251	269	310	326	339	340
Metallurgical and materials 1/.....	NA	139	153	143	150	155	175	190
Other, n.e.c.....	465	362	419	470	482	543	514	559
All sciences, total.....	7,606	8,111	8,595	9,338	10,096	10,678	11,257	11,594
Physical sciences.....	1,198	1,315	1,383	1,476	1,513	1,564	1,639	1,639
Astronomy.....	88	113	136	158	165	182	209	185
Chemistry.....	422	445	451	480	505	520	536	560
Physics.....	606	652	680	708	708	725	759	760
Other, n.e.c.....	82	105	117	130	134	137	135	134
Environmental sciences.....	650	681	700	791	869	949	966	994
Atmospheric.....	129	131	129	140	161	165	166	178
Earth sciences.....	187	205	218	238	243	274	274	269
Oceanography.....	260	262	264	306	329	324	335	363
Other, n.e.c.....	75	83	89	106	136	187	191	185
Mathematical sciences.....	157	161	170	183	203	206	205	209
Computer sciences.....	324	342	372	380	423	463	485	509
Life sciences.....	4,784	5,083	5,418	5,911	6,386	6,753	7,134	7,389
Agricultural sciences.....	349	353	377	418	450	498	536	558
Biological sciences.....	1,736	1,844	1,950	2,137	2,310	2,448	2,502	2,566
Medical sciences.....	2,503	2,671	2,849	3,113	3,370	3,537	3,829	3,996
Other, n.e.c.....	196	215	242	243	257	269	267	269
Psychology.....	153	164	186	215	234	242	249	254
Social sciences.....	212	226	253	281	338	359	389	427
Economics.....	54	54	60	66	77	76	80	91
Political science.....	26	25	29	35	43	50	60	63
Sociology.....	54	60	72	82	91	97	104	122
Other, n.e.c.....	78	87	92	99	127	136	145	151
Other sciences, n.e.c.....	128	138	112	102	129	142	189	172

1/ Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

KEY: n.e.c. = Not elsewhere classified.
NA = Not available.

NOTE: Because of rounding, figures may not add to the totals shown.

SOURCE: National Science Foundation/Division of Science Resources Studies, *Academic Research and Development Expenditures, Fiscal Year 1996*.

Table B-26. R&D expenditures at university-administered FFRDCs, by science and engineering field: fiscal years 1989–96

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Source and field	1989	1990	1991	1992	1993	1994	1995	1996
	[Millions of current dollars]							
Total.....	4,730	4,832	5,078	5,247	5,295	5,271	5,363	5,335
Field:								
Engineering, total.....	1,643	1,708	1,789	1,804	1,713	1,786	1,939	1,850
Aeronautical and astronautical.....	145	144	156	163	159	224	339	334
Chemical.....	40	41	70	78	76	79	69	69
Civil.....	16	15	16	34	33	31	31	29
Electrical.....	569	605	639	598	534	508	461	469
Mechanical.....	628	545	488	469	417	502	535	520
Metallurgical and materials 1/.....	NA	86	138	147	132	64	66	70
Other, n.e.c.....	244	273	282	316	362	379	438	359
All sciences, total.....	3,087	3,124	3,290	3,443	3,582	3,485	3,424	3,486
Physical sciences.....	1,828	1,825	1,917	2,010	2,209	2,156	2,182	2,141
Astronomy.....	112	112	121	138	145	158	142	147
Chemistry.....	274	261	252	268	281	273	252	258
Physics.....	1,378	1,383	1,461	1,498	1,675	1,630	1,688	1,631
Other, n.e.c.....	63	69	83	106	108	94	100	105
Environmental sciences.....	299	292	319	353	345	397	368	401
Atmospheric.....	99	103	126	149	156	184	188	209
Earth sciences.....	65	65	72	77	63	59	51	63
Oceanography.....	2	2	15	16	17	13	12	12
Other, n.e.c.....	133	122	106	111	108	140	117	116
Mathematical sciences.....	129	135	132	124	120	114	83	99
Computer sciences.....	668	686	716	700	649	619	572	626
Life sciences.....	131	142	146	191	191	122	120	125
Agricultural sciences.....	1	1	1	1	1	1	1	1
Biological sciences.....	101	113	115	139	137	99	90	105
Medical sciences.....	10	10	11	16	15	13	21	12
Other, n.e.c.....	18	18	18	35	38	9	8	6
Psychology.....	1	1	1	1	1	1	0	1
Social sciences.....	23	30	34	21	22	11	9	8
Economics.....	0	1	1	1	1	1	0	0
Political science.....	4	6	8	5	5	0	0	0
Sociology.....	0	0	0	0	0	0	0	0
Other, n.e.c.....	19	23	26	16	16	10	9	7
Other sciences, n.e.c.....	8	13	25	42	45	66	88	87

1/ Data for metallurgical and materials engineering were not collected separately prior to fiscal year 1990.

KEY: n.e.c. = Not elsewhere classified.
NA = Not available.

NOTE: Because of rounding, figures may not add to the totals shown.

SOURCE: National Science Foundation/Division of Science Resources Studies, *Academic Research and Development Expenditures, Fiscal Year 1996*.

Table B-27. Scientists and engineers primarily engaged in research and development activities, by sector of employment: 1985-96

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	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
	[Thousands]											
United States R&D S&Es, total.....	801.9	NA	877.8	NA	924.1	NA	960.5	NA	964.8	NA	987.7	NA
Total, all industries 1/.....	646.8	683.4	702.2	715.5	733.0	758.5	776.4	772.0	766.6	757.3	789.5	859.3
Manufacturing.....	575.8	597.6	603.0	601.9	NA	NA	NA	572.4	569.6	547.2	576.7	623.1
Food, kindred, and tobacco products (20,21).....	S	S	S	S	S	9.4	9.6	9.7	10.0	9.6	9.4	10.1
Petroleum refining and extraction (13,29).....	12.0	10.2	9.7	10.1	10.9	11.2	11.4	11.3	10.4	9.1	8.4	8.7
Chemicals and allied products (28).....	73.5	75.5	75.5	77.1	79.4	81.0	83.6	86.1	89.8	96.4	97.0	91.7
Machinery (35).....	85.7	92.8	97.1	99.4	106.8	111.5	104.5	98.4	83.9	69.5	78.0	88.0
Electrical equipment (36).....	115.6	124.2	131.5	127.5	113.8	100.6	93.9	90.6	92.9	99.9	114.6	130.9
Transportation equipment (37).....	169.8	183.3	187.8	186.8	177.8	159.9	145.4	144.3	138.6	125.2	138.7	159.2
Professional and scientific instruments (38).....	S	S	S	S	S	S	S	S	100.6	92.5	77.7	67.6
Other manufacturing.....	NA	NA	NA	NA	NA	NA	NA	NA	NA	45.1	53.2	67.0
Nonmanufacturing industries.....	71.0	85.8	99.2	113.6	NA	NA	NA	199.6	197.0	198.2	212.8	236.2
Transportation and utilities (40-42,44-49).....	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	29.3	29.4
Trade (50-59).....	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	47.5	43.6
Finance, insurance, and real estate (60-65,67).....	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.6	10.8
Computer and data processing services (737).....	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	77.3	81.2
Engineering and management services (87).....	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52.9	49.1
Other nonmanufacturing industries.....	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2	22.3
Federal Government, total 2/.....	52.1	51.6	54.3	54.2	58.8	59.4	58.3	61.8	60.0	NA	53.9	52.1
Research.....	22.3	21.2	22.4	22.4	24.6	24.7	25.2	25.8	25.1	NA	NA	NA
Development.....	29.7	30.4	31.9	31.7	34.2	34.6	33.1	36.0	34.9	NA	NA	NA
Educational institutions, total 3/.....	95.2	NA	112.4	NA	123.1	NA	117.1	NA	128.0	NA	134.3	NA
Basic research.....	43.6	NA	48.4	NA	52.7	NA	46.3	NA	49.5	NA	52.5	NA
Applied research.....	15.7	NA	24.1	NA	26.0	NA	23.3	NA	31.0	NA	34.1	NA
Development/design.....	1.4	NA	0.8	NA	0.9	NA	1.1	NA	2.7	NA	2.7	NA
Management/administration of R&D 4/.....	4.0	NA	3.9	NA	3.9	NA	3.9	NA	NA	NA	NA	NA
Science and engineering graduate students 5/.....	30.5	33.0	35.1	35.8	39.5	40.4	42.6	44.0	45.1	46.0	45.0	43.8
Nonprofit organizations, total 3/.....	7.8	NA	8.9	NA	9.2	NA	8.7	NA	10.2	NA	10.0	NA
Basic research.....	3.4	NA	3.4	NA	3.8	NA	3.2	NA	3.6	NA	3.2	NA
Applied research.....	2.2	NA	3.4	NA	3.2	NA	3.2	NA	5.3	NA	5.5	NA
Development/design.....	0.5	NA	0.4	NA	0.5	NA	0.6	NA	1.2	NA	1.3	NA
Management/administration of R&D 4/.....	1.7	NA	1.7	NA	1.7	NA	1.7	NA	NA	NA	NA	NA
Total United States civilian labor force 6/.....	115,461	117,834	119,865	121,669	123,869	125,840	126,346	128,105	129,200	131,056	132,304	133,943
R&D S&Es per 10,000 labor force.....	69.5	NA	73.2	NA	74.6	NA	76.0	NA	74.7	NA	74.7	NA

See explanatory information and SOURCE(S) at end of table.

Table B-27. Scientists and engineers primarily engaged in research and development activities, by sector of employment: 1985–96

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1/ Industry counts are for the average number of full-time equivalent R&D S&Es.

2/ Federal Government counts are for the number of S&Es whose work activity is classified as research or development.

3/ S&E counts for educational institutions and nonprofit organizations are for the number of employed doctoral S&Es who report their primary work activity as research, development or management of R&D.

4/ This category of primary work activity was not included in the 1993 and 1995 data.

5/ Number of full-time equivalent graduate students with research assistantships averaging an estimated 50 percent of their time engaged in R&D activities.

6/ Total labor force of the noninstitutional population, age 16 years and over.

KEY: NA = Data not available or not applicable.
S = Data withheld due to imputation of 50 percent or more.
S&Es = Scientists and engineers.

NOTE: The methodology for calculating R&D scientists and engineers was changed for 1985 and later years. These data are not strictly comparable with calculations previously published.

SOURCES: National Science Foundation/Division of Science Resources Studies, Survey of Industrial Research and Development; Survey of Doctorate Recipients; Survey of Graduate Students and Postdoctorates in Science and Engineering; U.S. Office of Personnel Management; and Bureau of Labor Statistics, *Employment and Earnings* (annual) and *Labor Force Statistics from the Current Population Survey*.

Table B-28. Number of employed doctoral scientists and engineers, by field of doctorate and primary work activity: 1995

Page 1 of 2

Field of doctorate	Total	Research & development					Non-research & development				
		Total	Basic research	Applied research	Development	Design 1/	Teaching	Management, sales, and administration	Computer applications	Professional services	Other activities
Total.....	484,780	198,890	66,190	97,780	23,590	11,340	106,970	79,380	21,120	59,810	18,620
Sciences.....	406,130	159,880	62,300	78,280	14,200	5,100	94,290	63,560	14,590	57,760	16,050
Computer and mathematical sciences.....	29,250	8,740	3,560	3,800	610	790	11,910	3,270	4,110	540	680
Computer and information sciences.....	6,440	2,320	730	1,150	200	240	1,820	660	1,540	S	80
Mathematical sciences.....	22,820	6,420	2,820	2,650	400	540	10,090	2,610	2,570	520	600
Life and related sciences.....	132,190	67,300	32,780	29,710	4,060	750	23,800	20,690	2,050	12,720	5,640
Agricultural and food sciences.....	15,440	8,230	1,430	5,830	870	90	1,940	3,020	390	770	1,100
Biological and health sciences.....	112,870	57,410	31,110	22,660	3,040	600	21,080	16,840	1,550	11,700	4,290
Environmental sciences.....	3,890	1,660	230	1,220	160	60	780	830	100	250	250
Physical and related sciences.....	101,300	52,520	16,580	25,610	7,750	2,590	17,130	17,850	5,850	3,920	4,030
Chemistry, except biochemistry.....	52,540	27,300	6,830	14,390	5,150	940	8,390	10,380	1,700	2,480	2,290
Geology and oceanography.....	13,090	6,640	2,580	3,690	310	60	2,890	1,830	590	470	690
Physics and astronomy.....	34,410	17,920	7,030	7,060	2,280	1,560	5,630	5,500	3,530	840	980
Other physical sciences (incl. earth).....	1,260	660	140	470	S	S	220	150	S	130	70
Social and related sciences.....	143,390	31,310	9,390	19,160	1,780	980	41,450	21,750	2,590	40,580	5,700
Economics.....	19,860	6,810	1,460	4,840	340	170	7,550	3,170	280	1,150	900
Political and related sciences.....	14,790	3,010	790	1,820	240	160	6,780	2,890	310	830	970
Psychology.....	75,810	12,420	4,260	6,980	720	460	12,990	10,350	1,100	36,520	2,440
Sociology and anthropology.....	20,530	5,630	2,000	3,330	210	90	9,180	3,290	440	1,170	820
Other social sciences.....	12,410	3,440	870	2,200	260	110	4,960	2,050	470	920	570

See explanatory information and SOURCE at end of table.

Table B-28. Number of employed doctoral scientists and engineers, by field of doctorate and primary work activity: 1995

Page 2 of 2

Field of doctorate	Total	Research & development					Non-research & development				
		Total	Basic research	Applied research	Development	Design 1/	Teaching	Management, sales, and administration	Computer applications	Professional services	Other activities
Engineering.....	78,650	39,010	3,890	19,500	9,390	6,240	12,680	15,810	6,530	2,050	2,570
Aerospace/aeronautical.....	3,350	1,690	180	1,030	280	200	590	690	260	S	100
Chemical.....	10,930	5,990	590	2,790	1,700	910	980	2,640	650	200	480
Civil.....	7,400	3,070	220	1,490	390	970	1,720	1,450	530	410	230
Electrical/computer.....	20,780	9,920	860	4,650	2,920	1,500	3,080	4,430	2,500	260	590
Industrial.....	2,240	580	S	360	S	130	940	440	220	S	S
Mechanical.....	9,710	5,100	520	2,410	1,320	850	1,750	1,640	720	220	280
Other engineering.....	24,230	12,660	1,480	6,770	2,730	1,690	3,630	4,520	1,660	890	870

1/ This category of R&D refers to "design" in the context of engineering, e.g., the design of equipment, processes, structures, and prototype models, as opposed to "design" in other contexts, e.g., the design of entire research programs, experiments, etc.

KEY: N = No cases reported.
S = Suppressed because fewer than 50 weighted cases reported. (See NOTE.)

NOTE: All numbers in the table are approximations derived from a sample.

SOURCE: National Science Foundation/Division of Science Resources Studies, *Characteristics of Doctoral Scientists and Engineers in the United States: 1995*.

Table B-29. Scientists and engineers engaged in R&D, and per 10,000 labor force population, by country: 1981-95

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Year	Number of scientists and engineers engaged in R&D							Scientists and engineers engaged in R&D						
	United States	Japan	Germany	France	United Kingdom	Italy	Canada	United States	Japan	Germany	France	United Kingdom	Italy	Canada
	[Thousands]							[Per 10,000 labor force]						
1981.....	683.3	311.0	124.7	85.5	127.0	52.1	40.5	61.9	54.5	44.0	36.3	47.5	22.9	32.6
1982.....	711.9	321.0	NA	90.1	128.0	56.7	44.1	63.6	55.6	NA	37.9	48.0	24.9	35.4
1983.....	751.7	347.4	130.8	92.7	127.0	63.0	46.1	66.4	59.0	45.7	39.1	47.7	27.3	36.3
1984.....	797.8	357.4	NA	98.2	129.0	62.0	49.2	69.2	60.3	NA	41.1	47.3	26.6	38.1
1985.....	801.9	380.8	143.6	102.3	131.0	63.8	53.8	69.5	63.9	49.7	42.8	47.3	27.1	40.8
1986.....	NA	393.0	NA	105.0	134.0	67.8	58.4	NA	65.3	NA	43.7	48.2	28.4	43.4
1987.....	877.8	415.6	165.6	109.4	134.0	70.6	60.5	73.2	68.3	56.4	45.4	47.9	29.4	44.1
1988.....	NA	434.6	NA	115.2	137.0	74.8	63.0	NA	70.5	NA	47.6	48.5	30.9	45.1
1989.....	924.1	457.5	176.4	120.4	133.0	76.1	64.6	74.6	73.0	59.2	49.6	46.8	31.4	45.4
1990.....	NA	477.9	NA	123.9	133.0	77.9	63.9	NA	74.9	NA	49.9	46.7	31.8	44.3
1991.....	960.5	491.1	241.9	129.8	128.0	75.2	69.3	76.0	75.5	61.0	51.8	44.8	30.6	47.9
1992.....	NA	511.4	234.3	141.7	131.0	74.4	72.1	NA	77.7	59.3	56.4	45.8	30.2	49.5
1993.....	964.8	526.5	NA	145.9	135.0	74.4	76.2	74.7	79.6	NA	57.9	47.5	31.9	51.7
1994.....	NA	541.0	NA	149.2	142.0	75.7	79.9	NA	81.4	NA	58.9	49.9	32.6	53.6
1995.....	987.7	552.0	231.1	151.2	148.0	75.5	82.2	74.7	82.8	58.7	59.6	52.1	32.5	54.8

KEY: NA = Not available.

NOTES: Table includes scientists and engineers (S&Es) engaged in R&D on a full-time equivalent (FTE) basis with the following exceptions: Japanese data include persons primarily employed in R&D in the natural sciences and engineering; and the U.S. data are a mix of scientists and engineers engaged in R&D on an full-time-equivalent basis and counts of scientists and engineers whose primary work activity is R&D.

SOURCES: National Science Foundation/Division of Science Resources Studies; Organisation for Economic Co-operation and Development.

Table B-30. International total R&D expenditures and R&D as a percentage of GDP: 1981–97

Page 1 of 1

Year	Total R&D expenditures 1/							R&D expenditures as a percentage of GDP						
	United States	Japan	Germany 2/	France	United Kingdom	Italy	Canada	United States	Japan	Germany 2/	France	United Kingdom	Italy	Canada
	[Billions of constant 1992 dollars]							[Percent]						
1981.....	109.36	34.53	23.50	16.60	17.33	6.89	5.23	2.32	2.13	2.43	1.97	2.37	0.88	1.25
1982.....	114.91	37.00	24.18	17.71	0.00	7.12	5.65	2.49	2.22	2.52	2.06	NA	0.91	1.40
1983.....	122.67	40.11	24.75	18.31	16.89	7.60	5.73	2.55	2.35	2.52	2.11	2.19	0.95	1.37
1984.....	134.27	43.45	25.58	19.52	0.00	8.35	6.30	2.61	2.43	2.51	2.21	NA	1.01	1.41
1985.....	145.60	48.25	28.24	20.32	18.41	9.56	6.83	2.74	2.58	2.72	2.25	2.23	1.13	1.45
1986.....	148.80	48.99	29.12	20.60	19.30	9.87	7.20	2.71	2.55	2.73	2.23	2.25	1.13	1.49
1987.....	151.50	52.49	31.27	21.49	19.71	10.70	7.27	2.68	2.62	2.88	2.27	2.19	1.19	1.44
1988.....	155.03	56.61	32.36	22.47	20.26	11.40	7.41	2.64	2.66	2.86	2.28	2.14	1.22	1.39
1989.....	157.77	61.98	33.79	23.93	20.89	11.98	7.56	2.60	2.77	2.87	2.33	2.15	1.24	1.39
1990.....	162.02	67.16	34.14	25.39	21.27	12.78	8.00	2.64	2.85	2.75	2.41	2.18	1.30	1.47
1991.....	164.94	68.79	36.58	25.75	19.64	12.41	8.13	2.71	2.82	2.61	2.41	2.11	1.24	1.53
1992.....	164.93	69.12	36.86	26.37	20.59	12.30	8.34	2.64	2.76	2.48	2.42	2.13	1.20	1.57
1993.....	160.94	67.33	35.47	25.75	20.70	11.19	8.86	2.52	2.68	2.42	2.45	2.15	1.14	1.63
1994.....	160.42	66.49	35.52	25.23	20.71	10.79	9.26	2.43	2.63	2.32	2.38	2.11	1.06	1.64
1995.....	169.86	70.66	35.73	25.10	19.63	10.43	9.50	2.52	2.77	2.30	2.34	2.02	1.01	1.65
1996.....	177.85	NA	35.95	25.21	19.28	10.70	9.71	2.57	NA	2.28	2.32	1.94	1.03	1.66
1997 prel.....	182.88	NA	36.51	NA	NA	11.14	9.81	2.54	NA	2.26	NA	NA	1.06	1.62

1/ Conversions of foreign currencies to U.S. dollars are calculated with OECD purchasing power parity exchange rates.

2/ Germany's data for 1981–90 are for West Germany.

KEY: NA = Not available.**NOTE:** Data are preliminary for 1997. Constant 1992 dollars are based on U.S. Department of Commerce calendar year GDP implicit price deflator.**SOURCES:** National Science Foundation/Division of Science Resources Studies; Organisation for Economic Co-operation and Development.

Table B-31. International nondefense R&D expenditures and nondefense R&D as a percentage of GDP: 1981–97

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Year	Total nondefense R&D expenditures 1/							Nondefense R&D expenditures as a percentage of GDP						
	United States	Japan	Germany 2/	France	United Kingdom	Italy	Canada	United States	Japan	Germany 2/	France	United Kingdom	Italy	Canada
	[Billions of constant 1992 dollars]							[Percent]						
1981.....	82.6	NA	23.0	13.4	13.7	6.8	5.2	1.75	NA	2.34	1.57	1.84	0.85	1.21
1982.....	84.9	NA	23.7	14.5	NA	7.1	5.6	1.84	NA	2.44	1.66	NA	0.89	1.36
1983.....	88.7	NA	24.1	15.2	13.1	7.4	5.6	1.85	NA	2.43	1.74	1.69	0.93	1.33
1984.....	95.8	NA	24.7	16.1	NA	8.0	6.1	1.86	NA	2.42	1.82	NA	0.97	1.36
1985.....	102.1	48.0	27.1	16.9	14.6	9.1	6.6	1.92	2.56	2.60	1.87	1.76	1.07	1.41
1986.....	101.9	48.8	28.0	17.0	15.7	9.4	7.0	1.86	2.53	2.61	1.84	1.82	1.08	1.44
1987.....	103.4	52.1	29.9	17.5	16.2	10.3	7.0	1.83	2.60	2.75	1.85	1.79	1.15	1.39
1988.....	107.8	56.2	31.0	18.3	17.1	10.8	7.1	1.84	2.63	2.74	1.85	1.80	1.15	1.34
1989.....	113.8	61.5	32.4	19.7	17.6	11.4	7.3	1.88	2.75	2.75	1.92	1.81	1.18	1.34
1990.....	120.9	66.6	32.6	20.5	18.0	12.4	7.7	1.97	2.83	2.62	1.95	1.84	1.26	1.43
1991.....	127.8	68.1	35.2	21.2	16.7	11.9	7.9	2.10	2.79	2.51	1.98	1.79	1.19	1.49
1992.....	129.4	68.4	35.5	22.3	17.6	11.9	NA	2.07	2.73	2.39	2.04	1.83	1.15	NA
1993.....	126.2	66.5	34.4	22.0	17.8	10.7	8.7	1.98	2.65	2.34	2.10	1.85	1.09	1.59
1994.....	128.5	65.7	34.3	21.8	18.0	10.3	NA	1.94	2.60	2.25	2.05	1.84	1.01	NA
1995.....	138.2	69.7	34.5	21.9	17.2	10.2	9.3	2.05	2.73	2.22	2.04	1.77	0.98	1.62
1996.....	146.5	NA	34.6	NA	17.1	NA	9.6	2.11	NA	2.20	NA	1.71	NA	1.63
1997 (prelim.).....	151.0	NA	NA	NA	NA	NA	9.7	2.10	NA	NA	NA	NA	NA	1.59

1/ Conversions of foreign currencies to U.S. dollars are calculated with OECD purchasing power parity exchange rates.

2/ Germany's data for 1981–90 are for West Germany.

KEY: NA = Not available.**NOTE:** Data are preliminary for 1997. Constant 1992 dollars are based on U.S. Department of Commerce calendar year GDP implicit price deflator.**SOURCES:** National Science Foundation/Division of Science Resources Studies; Organisation for Economic Co-operation and Development.